# Journal OF THE AMERICAN DIETETIC ASSOCIATION

VOL. 24, NO. 3 MARCH 1948

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***A. D. A. Annual Meeting, Boston, October 18-22, 1948***

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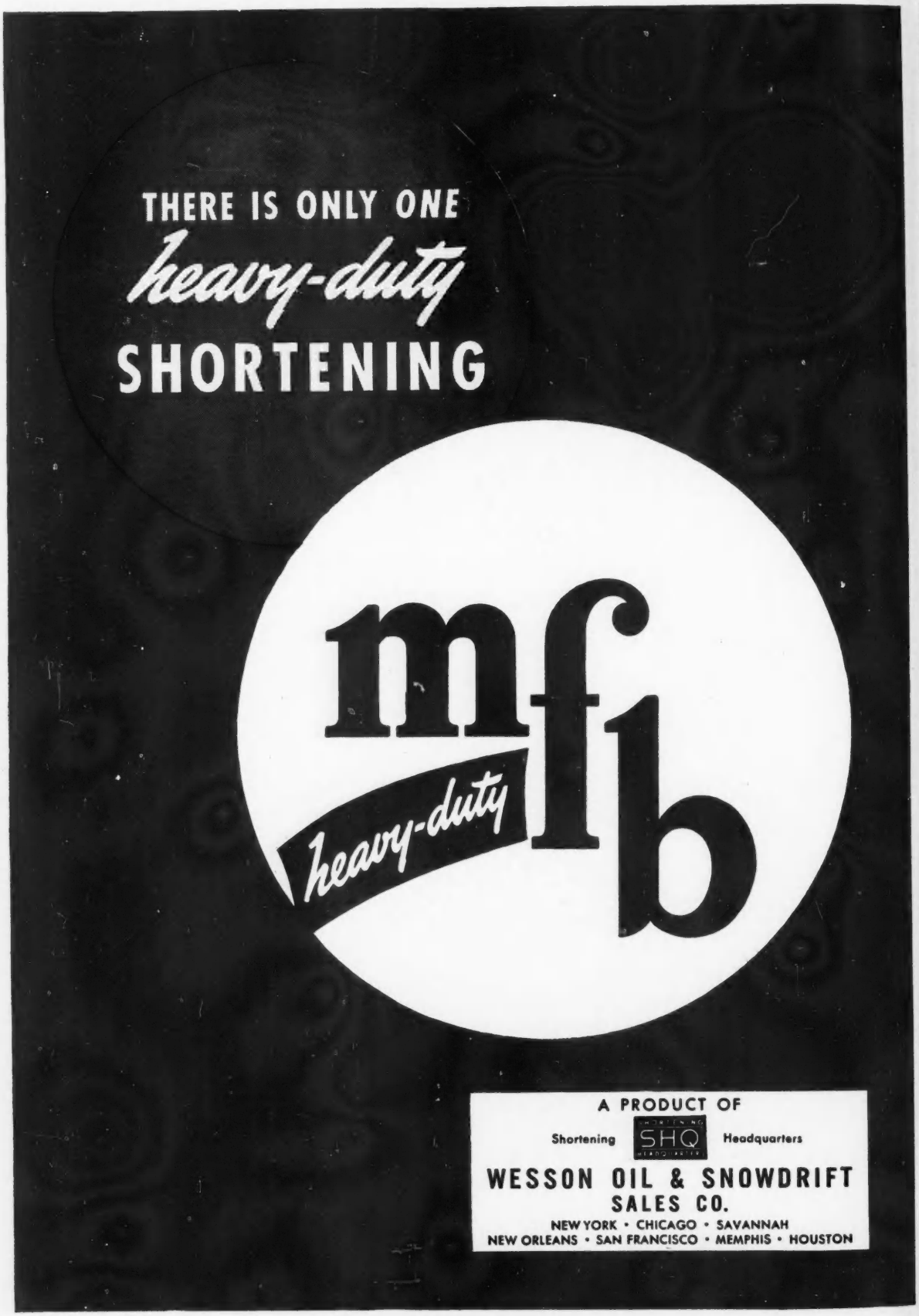
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VOLUME 24
NUMBER 3

# Journal OF THE American Dietetic Association

*Publishing Office*
Mt. Royal and Guilford Aves.
Baltimore 2, Md.

American Dietetic Association
620 N. Michigan Ave., Chicago 11, Ill

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The Journal of the American Dietetic Association is published monthly by the American Dietetic Association, Mt. Royal & Guilford Aves., Baltimore 2, Md., and 620 N. Michigan Ave., Chicago 11, Ill. Neither the Association nor the Editor assumes responsibility for the opinions expressed by authors of papers abstracted, quoted, or published in full in this Journal.

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*Editorial Correspondence:* All articles and notices for publication, general correspondence, and inquiries should be sent to the Editor at the American Dietetic Association, 620 N. Michigan Ave., Chicago 11, Ill. Manuscripts are accepted for publication on condition that they are contributed solely to the Journal. Copy must be double-spaced and original, not carbon, submitted.

*Advertising:* All correspondence concerning advertising should be addressed to the American Dietetic Association, 620 N. Michigan Ave., Chicago 11, Ill.

COPYRIGHT, 1948, BY THE AMERICAN DIETETIC ASSOCIATION Printed in U.S.A.
Entered as second-class matter June 30, 1925 at the Post Office at Baltimore, Md., under the act of August 24, 1912
Published Monthly by The American Dietetic Association

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# Dietary Approaches to the Study of Dental Caries[1]

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DEVELOPING methods by which the present high incidence of tooth decay can be reduced is the most important problem in preventive dental medicine. Certainly it is one of major importance in the broad field of public health and of particular significance in dietetics since diet influences both the oral and systemic environments in which the teeth develop, mature, age, and decay.

The rate of progress of even the most acute carious lesions in human teeth is sufficiently slow as to necessitate very long experimental periods and large groups of experimental subjects. The manifold difficulties which are encountered in any circumstance where the dietary intake of human subjects is to be carefully controlled for any purpose are well known to all responsible for dietary planning and enforcement. These handicaps, plus the lack of any entirely satisfactory assay of carious activity, make human experiments subject to errors which cannot be readily controlled. Thus the demand for experimental animals in investigations of dental caries is greater than in the study of many other human ailments. Despite this great need, there has been surprisingly little fundamental research on the causes and control of tooth decay, which has been at least partly due to the common belief that there is a high resistance to tooth decay among laboratory animals.

Early investigations with the white rat using natural foodstuff rations characterized by coarse particles were largely valueless because in the presence of those rations the fractures produced by the coarse particles apparently were essential for the initiation of any appreciable incidence of carious lesions. Thus the lesions had a partially mechanical origin which is not believed to be comparable to the initiation of carious lesions in human teeth.

If possible, experimental lesions had to be produced independently of mechanical factors and on highly controlled, reproducible dietary regimens. At present four species of experimental animals—the cotton rat, the white rat, the Syrian hamster, and the rhesus monkey—are known to have been used for investigation on the controlled production and prevention of carious lesions. In these four species, carious lesions can be readily produced under specified conditions by feeding rations composed of purified materials. These rations were typical of those used throughout all nutritional laboratories and were composed principally of casein, granulated sugar, mineral salts, and corn oil, supplemented with adequate amounts of the water-soluble and fat-soluble vitamins. The greatest attributes of these rations in this type of investigation is the excellent growth produced by the complete ration and the precise manner in which any nutritionally essential constituent can be varied from a superabundant to a suboptimal or acutely inadequate level. In addition, purified rations can be accurately reproduced continually or intermittently by any investigator in any laboratory.

Studies of this type have only been conducted in the last five years, since the use of purified rations in dental investigations has lagged far behind their development in nutritional laboratories. During this preliminary period, the cardinal purpose of fundamental research programs on dental caries had to be the development of experimental regimens in which carious lesions could be reliably produced or prevented at will. It is the development of these fundamental assays of the caries-producing properties of diets which we will consider. At present little more than a basic foundation for the controlled production of experimental carious lesions has been created. From this foundation it appears to be possible to design innumerable fundamental experiments to investigate the vital and urgent issues related to tooth decay.

The purified ration, or some comparable modification thereof, which has been used in all of the

[1] Presented at the 30th Annual Meeting of the American Dietetic Association in Philadelphia, on October 15, 1947.

experiments to be reported here is shown in Table 1. It is typical of the so-called "synthetic" rations used in nutritional research laboratories for the study of essential nutrients in a wide variety of animal species. The composition of this diet, although most unlike the rations composed of natural foodstuffs which were used in earlier investigations of experimental dental caries, is such that it supports excellent growth and fair reproduction in the cotton rat, white rat, and hamster and, with the addition of ascorbic acid, supports excellent growth in the rhesus monkey. Surely these criteria cannot be overlooked in choosing a ration for investigations of dental caries.

TABLE 1

*Basal purified ration used in dental caries experiments*

| INGREDIENTS | AMOUNT |
|---|---|
| Casein | 24 gm. |
| Sucrose | 67 gm. |
| Salt mixture | 4 gm. |
| Corn oil | 5 gm. |
| Whole liver substance | 2 gm. |
| 1:20 liver concentrate powder | 2 gm. |
| Thiamine | 350 mcg. |
| Riboflavin | 350 mcg. |
| Pyridoxine | 350 mcg. |
| Nicotinic acid | 2.5 mg. |
| Calcium pantothenate | 2.0 mg. |
| Choline | 100 mg. |
| Inositol | 100 mg. |
| Para-aminobenzoic acid | 30 mg. |
| Carotene | 1 mg. |
| Irradiated ergosterol | 300 I.U. |
| 2-methyl-1,4-napthoquinone | 0.6 mg. |
| Alpha-tocopherol | 5 mg. |

Let us first discuss those studies which have been performed with the cotton rat. In all of the following experiments, the control and experimental groups each had one or more representatives of each litter. In addition, the cotton rats were placed on the experimental regimen at weaning (about two weeks of age) when they weighed in the neighborhood of 20 gm. At this age and weight, the crowns of the first and second molars are almost fully developed and erupted but the third molars are in an early stage of development. Unless otherwise stated, all experiments were continued for a period of fourteen weeks after weaning.

One of the first observations made after the demonstration that carious lesions did develop in the molars of cotton rats fed the above purified rations for an optimum period of fourteen weeks was the wide variation in susceptibility to caries between different rats despite identical treatment during the experimental period (1).

At least part of this variation was due to a difference in the susceptibility of different strains of cotton rats. This variation necessitated a carefully maintained stock colony for the production of experimental animals. For example, after fourteen weeks on the caries-producing diet, the eighteen offspring of parent stock No. *5* had an average incidence of carious lesions of 31.3 with a range of 25 to 39 lesions per animal. In contrast, after fourteen weeks on the identical regimen, the thirteen offspring of parent stock No. *12* had an average incidence of carious lesions of 19.8 with an individual range from 0 to 33 lesions.

Analysis of variance indicated that the difference in susceptibility between these two strains and others was highly significant. However, individuals from caries-resistant strains responded in the same fashion to diets which reduced the incidence of carious lesions as did the individuals of the caries-susceptible strains. Of the members of the second generation, preliminary data indicated that the susceptibility to caries was similar to that of their parents. Attention was drawn to the necessity to distribute litters among the control and experimental groups of each experiment in order to reduce the variation in susceptibility to a minimum.

Since the production of carious lesions in the white rat had been demonstrated to be dependent upon the presence in the diet of carbohydrate particles of the proper coarseness, one of the first necessities was to determine if the production of carious lesions in the cotton rat was dependent upon the particle-size of the ingredients in the ration. Various methods for studying the relations of mastication and of particle-size to the incidence and extent of carious lesions have been explored in the cotton rat. One method for studying the effect of mastication upon the carious processes has been the extraction of the opposing molars in one quadrant of the skull. Sognnaes (2) and Ginn (3) had shown that in the white rat the extraction of antagonistic molars resulted in an extremely low incidence of caries in those molars which were unopposed when compared to the incidence in those molars which had opposing molars. However, in the cotton rat an entirely reverse situation occurs with the same experimental procedure (4). The molars with *no* opposing molars had almost as high an incidence and rate of progress of carious lesions as those with opposing molars. These data definitely establish that there is a lesser effect of mastication upon the initiation and progress of the carious lesions in the cotton rat than has been observed in the white rat.

A further test of the effect of particle-size on the initiation and progress of carious lesions has been made by the complete substitution of finely ground sucrose in the form of confectioner's sugar for the

fine, granulated sucrose used in previous experiments. Shaw (5) observed that the incidence and rate of progress of carious lesions in cotton rats fed the ration containing the confectioner's sugar were the same as for the litter mates which received the ration containing granulated sucrose.

From (a) a study of the carious lesions in histological preparations, (b) the extraction experiment, and (c) the replacement of fine, granulated sucrose by confectioner's sugar, it appears extremely likely that the carious lesions develop independently of the effects of mastication and the particle-size of the ration.

The effects of different dietary carbohydrates on the incidence and extent of dental caries have been investigated by Schweigert *et al.* (6, 7). A very high incidence and extent of carious lesions were noted when glucose, fructose, dextri-maltose, or maltose was used in place of sucrose in the basal caries-producing ration. The replacement of one half of the sucrose by lactose did not alter the progress of tooth decay. However, when fine dextrin and coarse dextrin were used instead of sucrose, there was a very low incidence and extent of tooth decay. There was no appreciable difference in the results obtained with coarse or fine dextrin. The replacement of one half of the sucrose with fine dextrin did not reduce the severity of tooth decay as compared to the cotton rats which received the sucrose diets. The replacement of three quarters of the sucrose with fine dextrin reduced the incidence and extent of the carious lesions by about 30 per cent.

In this laboratory (5) the complete replacement of granulated sugar by fine or coarse dextrin resulted in striking reductions in the incidence and extent of tooth decay. However, the ingestion of the coarse dextrin resulted in extensive attrition and fracturing of the molar cusps with a resulting modification of the normal structural characteristics of the sulci. When the carious lesions were observed in the animals fed the diet containing coarse dextrin, they were usually on the exposed dentin surfaces and not on intact enamel surfaces. The effect, therefore, of the replacement of granulated sugar by coarse dextrin entails not solely a replacement of the form of carbohydrate, but in addition a modification of the structure of the teeth and apparently in this way a modification of susceptibility to caries of the altered teeth.

The diet containing fine dextrin was comparable to the basal ration in the amount of attrition produced and the freedom from fractures. The lesions produced in cotton rats on this diet were characteristic of early lesions in animals fed the basal ration. However, cotton rats appeared to dislike the diet containing finely powdered dextrin, even though they did not refuse or waste the diets in which fine confectioner's sugar had been used instead of granulated sugar. As a result of this dislike, the cotton rats ate insufficient amounts to allow normal growth and well-being. This may be a complicating factor in the initiation and development of carious lesions on this dietary regimen. Thus, the feeding of diets containing either coarse or fine dextrin results in complications which cannot be attributed to the replacement of sucrose *per se* and which may affect the initiation and development of carious lesions.

Due to the possible effect of the restricted intake on the incidence of dental caries in the experiment using the fine dextrin, a small experiment was performed to test the effect of controlled restriction of diet. As seen in Table 2, the restriction of food intake resulted in a great decrease in the incidence of carious lesions and a still greater decrease in the rate of progress of carious lesions. This may explain a large part of the reduction in the susceptibility to caries of the cotton rats receiving the ration containing fine dextrin.

TABLE 2

*The average incidence and extent of carious lesions in normal cotton rats compared with those of animals whose food intake has been restricted*

| AMOUNT OF FOOD PERMITTED | NO. OF COTTON RATS | WEIGHT INCREASE | NO. OF CARIOUS LESIONS | | EXTENT OF CARIOUS LESIONS | |
|---|---|---|---|---|---|---|
| | | | Mean | Standard error | Mean | Standard error |
| | | *gm.* | | | | |
| Controls fed *ad libitum* | 9 | 73 | 26.1 | 2.2 | 79+ | 9+ |
| 65 per cent of amount which controls received | 11 | 32 | 17.5 | 1.8 | 35+ | 6+ |
| 50 per cent of amount which controls received | 6 | 16 | 12.0 | 1.5 | 20+ | 3+ |

The inhibitory effects of fluorine as sodium fluoride in the ration were studied by Shaw *et al.* (8). Amounts of fluorine were tested from 22.5 to 450 p.p.m. (parts per million) as shown. No inhibition of the incidence and extent of carious lesions was observed when 22.5 p.p.m. of fluorine were present in the ration. When 45, 90, and 135 p.p.m. of fluorine were included in the ration, there was a progressive decrease in both the incidence and extent of carious lesions. The ingestion of 225 or 450 p.p.m. of fluorine produced the maximum inhibitory effects with a 90 per cent reduction in the incidence and extent of carious lesions.

A slightly inhibitory effect of fluorine on the formation of pigment in the enamel of the incisors was observed when 45 p.p.m. of fluorine were fed. With 90 p.p.m. or more of fluorine, the incisors were pale,

but no chalkiness was observed until 450 p.p.m. of fluorine were ingested in the ration. Mottling of the third molars was observed when 135 p.p.m. of fluorine or more were fed. No indication of a greater percentage reduction in the dental caries incidence was observed in the third molars than in the first and second molars, even though the third molars were partially formed during the period of fluorine ingestion. The fluorine content of dextrin was determined and found to be insufficient to contribute to the reduction in caries observed on the rations containing dextrin.

Schweigert and co-workers (9) studied the effect of various levels of fat and protein on the incidence and extent of carious lesions. Due to the higher caloric value of fats than of carbohydrates and proteins, it was judged wisest to make all replacements of carbohydrate on an isocaloric basis. Since the caloric value for fats is nine and that for proteins and carbohydrates is four, whenever 1 gm. of additional fat was introduced into the basal ration, 2.25 gm. of carbohydrate were removed, but when 1 gm. of additional protein was introduced only 1 gm. of carbohydrate was removed. Therefore, the ratio of energy to vitamin and mineral composition of all rations was constant.

The isocaloric substitution of ten parts of lard for sucrose resulted in a 50 per cent reduction in the average incidence of carious lesions and a 75 per cent reduction in the extent of tooth substance involved in the carious processes. The total fat content of this ration was 16.4 per cent while the sucrose content was 48.6 per cent in contrast to a fat content of 4.8 per cent and a sucrose content of 64.4 per cent in the basal ration. When twenty parts of lard were substituted isocalorically for forty-five parts of sucrose, there was a 90 per cent reduction in the incidence and extent of carious lesions in comparison to the litter mates maintained on the basal ration. This high-fat ration had a total fat content of 31.7 per cent and a sucrose content of 27.8 per cent.

When the content of casein of the ration was increased from 24 to 50 per cent at the expense of sucrose, without any change in the amount of fat present, a 50 per cent decrease in the average number of carious lesions and 70 per cent decrease in the average amount of tooth substance involved were observed. The percentage of sucrose in this ration was 40. When a ration with fifty parts of casein and ten parts of lard replacing appropriate amounts of sucrose was fed, there was almost a complete prevention of carious lesions in comparison to the control litter mates.

These workers (9) also observed that cotton rats which were maintained from weaning for fourteen weeks on a diet consisting solely of mineralized whole milk or mineralized whole milk plus Wilson's 1:20 Liver Concentrate developed no carious lesions. The incidence and extent of carious lesions were very low when a ration was fed which approximated the composition of milk solids in its fat-protein-carbohydrate-salts distribution.

The addition of inert materials, such as Cellu flour and agar, to the basal ration was attempted to determine if such supplements would alter the nutritional value or the caries-producing ability of the ration. No effect was observed when as much as 10 or 20 per cent Cellu flour or 10 per cent agar were added (5).

Knowing that Cellu flour *per se* had no effect on the incidence of carious lesions in the cotton rat, additions of Cellu flour could be made to the various high-fat rations in order to approximate more nearly the consistency of the basal ration. In this way it was possible to determine, at least partially, if the effect of increases in fat composition were due to the altered consistency of the ration, to a coating of the particles of sucrose with fat, or to other factors. In every case the addition of Cellu flour to rations containing additional amounts of lard did not alter the incidence of caries observed in the same ration without added Cellu flour. Therefore, it seems unlikely that the consistency of the ration was responsible for the reduction in the incidence of caries with the increase in lard. Nor was the decrease in carious lesions entirely proportional to the increase in fat content. In addition, through the increase in the number of particles in the diet without an increase in the caloric value, the fat present would be unable to coat all particles to the extent obtained when no Cellu flour was added. Also, the replacement of fine, granulated sucrose with confectioner's sugar in rations with different fat levels indicated that the amount of fat present was more important than distribution.

Let us now consider the susceptibility to caries of the white rat on similar experimental regimens. When a group of weanling rats, born of females on a stock diet, are fed the above basal purified ration for even as long as six or eight months, Sognnaes (10) has demonstrated that the incidence of carious lesions is extremely low. However, when the female rats were transferred to the basal purified ration at the time the litters were born, there was a much higher incidence of carious lesions in the molars of the offspring. In addition, the carious lesions develop sufficiently early that a long experimental period is unnecessary. If the female rats are transferred to the purified ration prior to gestation, the caries incidence of offspring maintained on the purified ration is much higher than that observed under the two previous experimental regimens. These data indicate very strongly that the purified ration, when fed during the period of tooth development, is responsible for a greater incidence of caries than if the teeth develop during the feeding of stock rations.

The susceptibility of the Syrian hamster to dental

caries was first reported by Arnold (11), who observed carious lesions when the hamster was maintained on stock rations. He also reported that the particle-size of the stock ration was unimportant in the production of carious lesions.

Keyes (12, 13) has continued the investigation of experimental carious lesions in this species using rations consisting largely of natural foodstuffs. The ration which he found to be most cariogenic was composed of whole wheat flour, whole milk powder, confectioner's sugar, corn starch, and alfalfa leaf meal. When this ration was fed at any time after weaning, carious lesions developed on the smooth and subgingival surfaces of the hamster molars within a few weeks. In contrast, when weanling hamsters were fed the purified ration of Shaw *et al.* (14), a very low incidence of carious lesions occurred. However, Sognnaes (10) demonstrated that if female hamsters were changed to the purified ration when the litters were born, there was an increased susceptibility to carious lesions. If the purified ration was fed through gestation, lactation, and to the offspring after weaning, a still higher incidence of caries was observed. Since the hamster is particularly susceptible to the development of carious lesions on the smooth surfaces, the use of this species is highly desirable to supplement studies in the cotton rat and white rat where the lesions occur primarily in the sulci and on the proximal surfaces.

Lastly, there is a small amount of similar work to discuss about the rhesus monkey where the purified ration used in rodent studies, supplemented with ample ascorbic acid, was found to be adequate for growth and physical well-being. In a survey of 138 monkey skulls, the relation of the period of time that the monkeys were maintained on the purified rations to the incidence of carious lesions was determined by Shaw, Elvehjem, and Phillips (15). A high incidence of carious lesions after eighteen months under experimental conditions was observed. Numerous surveys of the incidence of caries in rhesus monkeys maintained for longer periods on natural rations have all indicated a very low susceptibility to caries.

Such a difference would suggest that an assay for the caries-producing ability of a ration with rhesus monkeys as experimental subjects might be possible. The testing of this hypothesis seemed vital because of the great similarity between teeth of the rhesus monkey and human teeth. The most hopeful pathway seemed to lie in the comparison of the above purified, caries-producing ration with rations which had been demonstrated in rodents to have a much lower caries-producing ability. In this way two purposes could be tested simultaneously: (a) the possibility of developing an assay in the rhesus monkey and (b) the evaluation of whether the development of carious lesions in as widely different species as the rodents and the rhesus monkey might be influenced similarly or differently by the same experimental treatments. Such an experiment is underway at present with preliminary results indicating incontrovertibly that an assay is possible with the rhesus monkey and that widely different species do react similarly in the production and prevention of carious lesions by dietary means.

## SUMMARY

Evidence obtained under carefully controlled experimental regimens has been presented to indicate the susceptibility to caries of four species of laboratory animals—the cotton rat, the white rat, the Syrian hamster, and the rhesus monkey. Since the initiation and development of carious lesions in these four species have many similarities to dental caries in man, intensive fundamental investigations should be undertaken to explore the relation of all factors to the production and prevention of carious lesions.

The high sucrose content of the rations used in these studies must not be taken as evidence at this time of a caries-producing effect of sucrose itself. The caries-producing effect of these purified rations is not in itself evidence that sucrose is the causative agent of caries. These early investigations must be considered as only the foundation upon which more exacting studies can be designed. As more knowledge of carious lesions is obtained through experimental procedures of this and other types, not only the role of sucrose, starches, and refined foods but also the effect of various protective factors on the susceptibility to caries can be more adequately explored.

Through the use of experimental animals, the effect of diets upon the susceptibility of teeth to tooth decay can be studied in greater detail and with more assurance of controlled conditions than is possible in experiments with human subjects. The fact that the effects of diets can be studied both during and after the development and maturation of the teeth adds further to the usefulness of experimental animals for research in dental caries.

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## *Formation of The Pharmaceutical-Medical Research Foundation*

At the meeting of the American Pharmaceutical Manufacturers' Association held in New York City in December, Dr. Morris Fishbein, Editor of the *Journal of the American Medical Association*, announced the appointment of a committee to establish The Pharmaceutical-Medical Research Foundation. The idea of this new foundation was first conceived by Charles Wesley Dunn and is based upon the success of The Nutrition Foundation, Inc., which was organized in 1941 and is supported by food and related manufacturers.

The Pharmaceutical-Medical Research Foundation, which will be the first joint action by the pharmaceutical industry and the medical profession, will be financially supported in major part by the pharmaceutical industry as a contribution to the national welfare. The new Foundation, like The Nutrition Foundation, will have as its primary purpose the promotion of basic research and the improvement of the public health.

The new organization's governing board will include representatives of the general public as well as representatives of the pharmaceutical industry, and the medical profession. It will be this governing board which will determine the Foundation's program of scientific research, on the basis of a recommendation by an authoritative scientific advisory committee and the advice of an eminent scientific director. It is contemplated that the initial basic research will be in the field of the degenerative diseases, where there is an urgent need.

## *Helen W. Atwater International Scholarship Fund*

Shortly after the death of Helen Atwater last summer, a group of her friends started a movement to establish a "Helen W. Atwater International Scholarship Fund" in home economics. The committee for this fund, which is headed by Katharine Blunt and Sybil L. Smith, Co-chairmen, is now soliciting contributions. Since the bringing of foreign students to this country was one of Miss Atwater's great interests, such a memorial is highly fitting.

The executive committee of the American Home Economics Association has given its enthusiastic approval of the plan and has voted to name for Miss Atwater one of the present international scholarships when supplemented by funds raised by this committee. It is hoped that enough money will be raised to attract applicants with superior training and ability who may be expected to make a notable contribution to the cause to which Miss Atwater gave so much of her energy, enthusiasm, and time.

Contributions should be addressed to the American Home Economics Association, 620 Mills Building, Washington 6, D. C.

# The Low-Sodium Diet in Vascular Diseases[1]

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IN ORDER TO present the evolution of the therapeutic low-sodium diet, a brief background of the role of sodium in physiology and disease will be given (1–5). In addition, the present recognized indication for restriction of sodium will be discussed as well as the practical limitations and difficulties of administering a low-sodium diet.

The prehistoric ancestor of the vertebrates left his home in the sea for fresh water at a time when the salt concentration of the sea was less than it is at present (1). Presumably the tissues of this animal were bathed in a fluid of composition similar to that of his environment. His descendants have inherited essentially the same composition of the fluid which surrounds their tissues. The development of the mammalian kidney permits the constancy of this internal environment to be maintained almost without regard to the nature of the food or the activity of the individual, and the human kidney has emerged as an amazingly complicated, though somewhat inefficient instrument. To begin with, water and dissolved solids are filtered out of the blood, the force of the heart serving to effect this. The filtration amounts to about 125 cc. of water per minute or 170 liters a day (2, 3, 6). This requires no work on the part of the kidney, for the work is all done by the heart gratuitously.

The work of the kidney is to return most of this water and a great part of the salts to the blood stream. In so doing, over 99 per cent of the filtered water, containing about 1.4 kg. of sodium chloride, is thus reclaimed each day. This constitutes a major portion of the excretory effort of the kidney. Paradoxically the kidney, therefore, does its greatest work when it excretes the least urine, for if 170 liters of dilute urine whose composition was that of a blood filtrate could be excreted per day, the kidney would be doing no excretory work.

Expensive as this arrangement is, it acts to conserve both water and salt. The body of an average adult weighing 70 kg. is approximately 70 per cent water (2–5). Most of this, about half of his body weight, is within the cells, and it contains little sodium or chloride. The remainder of the water constitutes the fluid which surrounds the tissues, called the interstitial fluid, and the fluid of the blood plasma. Together, these two are called the extracellular fluids, and are where most of the sodium and chloride of the body is found. This volume, approximately 15 liters of fluid, contains several kinds of dissolved salts in dilute solution. Although sodium and chloride are present in greatest amounts, 120 gm. of table salt would provide the total sodium and more than the total chloride of the body. Thus the 1.4 kg. of sodium chloride filtered by the kidney represents over one hundred times the body store.

The properly functioning kidney is able to return accurately to the circulation all but the excess provided by the daily diet. The daily intake of salt is variable (5 to 10 gm.). Although this is a sizeable percentage of the total body salt, it is minute in comparison to the amount filtered. Nevertheless, the normal kidney can maintain an essentially perfect balance of salt concentration in the extracellular fluid, conserving or excreting the proper proportion of salt and water.

In many parts of the world, salt must have been quite unobtainable to primitive man, and some existing tribes even now do not use or possess salt (7). The advance from nomadic to agricultural life marked the introduction of the habitual use of added salt to supplement the cereal, vegetable, and boiled meat diet. Although the salt craving of certain animals is well known, apparently man's need for salt is more generally satisfied and does not have an instinctive basis. The great historic and economic importance of salt probably attaches to its value as a preservative in greater measure than to its use as a seasoning, and certainly not to any degree to its physiological need.

To discuss the function of salt in the body, we must become somewhat more precise in our definition. Sodium chloride does not exist as such in the body but is in solution in the form of ions. It is, therefore, incorrect to speak of the sodium chlor-

[1] Condensed from a paper read at the Institute on Organization and Operation of the Hospital Dietary Department, conducted by the Council on Professional Practice of the American Hospital Association at Ann Arbor, Michigan, on June 27, 1947.

ide concentration of blood, urine, fluid, or of tissues unless the ionic concentration of each be equivalent—that is, if sodium chloride were to be removed by precipitation and neither one ion nor the other would remain behind in excess. Since this is rarely true, we shall speak of the respective ions and although we may continue to say grams or milligrams of sodium, we do not refer to the metal sodium but to the weight of sodium ions. However, we are primarily interested in the reaction rather than the weight of these substances—and chemicals react molecule for molecule and ion for ion, rather than gram for gram (2, 3). Thus, the clinician is learning to speak of *equivalent* amounts of these ions—unit sized packages so to speak, each package containing a number of ions just equivalent to react with another package. The extracellular fluids of the body are slightly alkaline and contain more sodium than chloride ions. Sodium makes up most of the positively charged ions of the plasma and tissue fluid while chloride, with bicarbonate and protein, makes most of the negative ions.

With the exception of protein, these ions and water are free to diffuse readily from the vascular system into the interstitial fluid. Just as the glomeruli filter water and salt in the kidney due to the pressure of the blood, so the pressure of blood tends to filter water and salt out of the arterial end of the capillary and into the tissues of the body (4, 8). This tendency is opposed by the resistance of the tissues to being stretched and by the tendency of water to diffuse back again at the venous end of the capillaries where the pressure is less. Protein is for the most part retained within the blood vessels.

Thus pressure is necessary to establish this filtration, for the concentration of water molecules in the filtered fluid, where there is little or no protein, is made greater than the concentration of water molecules in the plasma. Therefore, water has a tendency to diffuse back into the blood stream, which it can normally do at the venous end of the capillary. This process, that of water diffusion from a region of high water concentration to a region of lower water concentration, is called "osmosis" (2, 4, 10). The balance of these three tendencies—that is, filtration of water and salts from the blood stream, resistance to filtration due to stretching of the tissue, and reabsorption of water and salts into the blood stream by osmosis—determines the size of the interstitial fluid compartments.

In regard to the cells of the body themselves, water, but not sodium, is free to enter and to leave (1–5). Since sodium is essentially unable to cross the cell membrane, a decrease or increase of sodium concentration in extracellular fluid will result in a diffusion of water to or from the body cells, in order to maintain the total concentration of water and dissolved salts equal inside and outside the cell. In this manner, the sodium concentration of the extracellular fluid controls the degree of hydration of the tissue cells. For example, an increase in sodium concentration in the blood due to the ingestion of sodium results in an increase in sodium concentration in all the extracellular fluid. Water will then tend to diffuse from the cells of the body into the tissue fluid, diluting it, and causing thereby a cellular dehydration, if no other source of water is provided. Presumably, this is the mechanism which sets the signals for the renal conservation of water and thirst (9). When sufficient water is retained, the water and sodium concentrations are again restored to normal and until the kidney disposes of the extra sodium, there is simply a larger volume of extracellular fluid present. This is the normal mechanism, and this circumstance explains part of the depot or storeroom function of the extracellular fluid and its variation. It is, moreover, like a supply room that must keep a certain ratio of its materials on hand, almost as if by a "tie-in sales arrangement," but in this case, usually for the consumer's benefit.

It is easy to see that this may be carried too far, and if the extracellular fluid becomes too large, edema will result. In thus defining edema as a clinically-increased extracellular fluid volume, whether regional or general, we refer not only to the water but to the salts as well and particularly direct attention at this time to the sodium. Wherever this edema occurs, we are dealing with a net retention of sodium by the organism, and from a dietary point of view, a restriction of sodium is logically indicated as part of the treatment. Into this category, we may place the normal premenstrual water and salt retention which at times leads to visible edema, particularly where salt intake is high; the edema of venous or lymphatic obstruction; of reduced plasma proteins; of forced dependency and immobilization; and the water retention that often ensues during the initial phases of caloric restriction. The disorders with which we are most concerned clinically, from the standpoint of frequency of occurrence and the length of disability which results, are the edema of heart failure and the edema of nephritis. It is in the treatment and prevention of edema arising from these disorders that the low-sodium diet has proved of greatest value.

It is advantageous to trace the steps which have led clinicians to use the low-sodium diet in the treatment of these diseases, since these steps were not always based upon an understanding of physiology as we now reckon it. At the beginning of the present century, Widal noted that edematous nephritic patients excreted little water and little salt (11). It was therefore concluded that the damaged kidney was unable to excrete these substances, and that the consequent retention of water and salt produced the edema. The restriction of water in the treatment of edema is traceable to Hippocrates but with the above hypothesis something new was added—the restriction of salt. It was considered that the

chloride ion was the responsible part of the salt, probably simply because chloride was easily estimated. The concept thus founded—that of fluid and chloride restriction—has confused the clinical literature to this day.

On the other hand, the studies of Newburgh and his school have given us an understanding of some of the relationships of water and salt in the patient with nephritis and with nephritic edema. In 1932, Lashmet and Newburgh (12) showed that the kidneys of the patient with edema of nephritis were able to excrete water and salt despite the tendency of the body to retain them. If adequate water was provided for the salt taken, some water could be rendered available to the kidney and a normal excretion of water and solids might occur. They demonstrated that ample fluids are requisite, especially to the damaged kidney that cannot concentrate its waste, and pointed out that the only chance of preventing retention of solids in such instances is by a large water intake. Recalling how the renal concentration of water means renal work, we can now add that ample fluids presented for renal excretion will tend to lessen the work that the kidney does in excreting its water and salt (2, 3). The ban on water was lifted, and reason now tends to dominate the decision as to the amount of fluid permitted. Nevertheless, old ideas are fixed and up to the present, we read in our best texts, "if kidney function is good, fluid restriction is indicated in all edematous patients" (13). The need for restriction of *sodium* was furthermore emphasized and reaffirmed by Newburgh's demonstration that sodium was retained in the body of a nephritic patient who manifested the tendency to form edema (12).

In closely parallel fashion, it has long been customary to restrict salt and water in the treatment of the edema associated with heart failure. In 1901, it was shown that sodium chloride given to patients with heart disease was not readily excreted but went to form edema (14). Karrell had some years earlier used a diet of 600 to 700 cc. of milk in treating heart disease (15). This was now welcomed because it was recognized to be low in salt and limited in fluid. With occasional exceptions, fluid and salt restrictions have been continued with the greatest emphasis being placed on the fluid restriction, and currently recommended texts urge fluid restriction in the edema of cardiac failure (13, 16, 17). Following the demonstration of the value of adequate fluid to the patient with nephritis and edema, it remained for a student of Newburgh, Shemm (18), to establish that cardiac edema could be effectively treated in the same fashion, namely by adequate fluid if sodium was restricted, and for Schroeder (19, 20) to show that the reduction in sodium was most important, for although water alone may act as a diuretic, salt and water serve as an anti-diuretic. He further showed clearly that it was the sodium and not the chloride that was of importance. He stated "the rationale of fluid restriction is not clear. Dehydration may occur and the deposition of edema may be lessened, but it is uncertain that diuresis is thereby initiated." Wider clinical acceptance of this principle of administering adequate fluid with a low-sodium intake is to be anticipated now that confirmation of its efficiency in the treatment of cardiac edema has been reported (21–24).

In the matter of hypertension, things are quite different. Hypertension often occurs with nephritis. Sometimes edema is also present. Hypertension is a major cause of heart failure with attendant edema. Nevertheless, these constitute no logical reason to apply the low-sodium diet to the treatment of hypertension. After the demonstration of the efficacy of salt restriction in edema (which was ascribed to chloride restriction), chloride restriction was attempted in the treatment of hypertension (25–27). This was done partly on the basis that chloride might primarily be retained in this disorder or that the high blood pressure might be due to an increase in blood volume or due to the necessity of the body to force the renal filtration of extra water and salt. The prime American exponent of this therapy was Allen, who in 1922 (28) reported 180 cases in a detailed study and claimed good results. Most of his patients were very well studied and his diets were well restricted, even by present standards. These studies found support in the less elaborate work of others (29–32). One of these (32) pointed out that the sodium was the important factor, since in his studies sodium chloride resulted in increased blood pressure and potassium chloride was followed by a fall in blood pressure. He argued, therefore, for the use of potassium salt in the treatment of hypertension. His theory of the causation of hypertension found no contemporary echo, nor did anyone else note the importance of limiting sodium as against chloride. Moreover, contemporary confirmation of Allen's results was generally lacking (33–35). The therapy was criticized as having no good foundation, as perhaps pure empiricism, or as a clever method to prevent overeating by rendering the food less palatable. Moderate salt restriction was adequately demonstrated to be ineffective, and today's texts state that in uncomplicated hypertension, in the absence of edema, salt need not be restricted (13, 36, 37). Until recently then, salt restriction for hypertension fell into a convenient discard.

The recent reports of Kempner (38–40) on the effects of a rice diet in hypertension have stimulated a resurrection of the low-salt concept. Kempner created a diet which he considered would impose least strain on the damaged metabolism of the kidney. It was his idea that hypertension was among the consequences of a disturbed renal metabolism. His diet, consisting of rice, sugar, fruit, and fruit juices, provides about 2000 calories containing 20 gm.

of protein and about 0.2 gm. of sodium in 1000 cc. of total fluid. He has reported on 192 patients with hypertension. His cases were rather a selection of more severely ill than mild patients. Twenty-five died during treatment, five had an acute disorder, and of the remaining 162 studied, benefit is claimed for 102 or 63 per cent. These results deserve detailed analysis, but for our present purpose, they may be simply compared to Allen's overall results (28) where improvement was claimed in 61 per cent of 180 cases. Allen's diet was more liberal, containing 3000 to 3500 calories, 50 to 100 gm. of protein, and an estimated 0.2 to 0.5 gm. of sodium. Striking as these results may seem, the long history of failure of therapy in this disease is a deterrent to enthusiasm. Grollman has suggested that the rice diet is effective because of its salt restriction, and he was able to demonstrate a reduction of blood pressure in rats who had been made experimentally hypertensive, when there was a drastic restriction in sodium intake (41).

Collateral evidence has been brought forward by Selye (42) indicating the importance of sodium in certain disorders (including nephrosclerosis and hypertension) which may be produced in experimental animals. He considers that excessive activity of certain pituitary or adrenal cortical hormones may be initiated as part of a "general adaptation syndrome"—a response of the organism to many and non-specific types of disturbances. He points out that an overabundance of certain adrenal cortical (and/or anterior pituitary) hormones will tend to favor the development of vascular and kidney lesions, and of hypertension in the experimental animal, *particularly if there is a high-sodium intake.* In human beings, hypertension is often seen in conditions where there is overactivity of the adrenal cortex (Cushing's syndrome). Elevation of blood pressure can be produced in normal individuals, in patients with Addison's disease or with hypertension, by administering an adrenal cortical hormone (desoxycorticosterone). This is dependent at least in part upon the concomitant administration of sodium (43, 44).

Grollman and his co-workers (45, 46) have reported on six subjects studied for 50 to 120 days, in whom a drastic restriction in dietary sodium resulted in a lowering of blood pressure. Upon the addition of sodium chloride to this diet, they also demonstrated a rise in blood pressure. A report has appeared (47) on 100 patients treated by a diet containing approximately 200 mg. of sodium, which claims favorable results, but lacks mention of any sort of control.

None of the studies cited have completely proved their point. Except that analyses for sodium are now more reliable, we are but little further than the studies of Allen. While his controls were not rigid, he evaluated the role of caloric and protein restriction, and he also found that, by supplementing with sodium chloride, the blood pressure rose again. Both Allen and Kempner have had the tremendous psychological advantage of a special organization geared for their work and the enthusiasm that stems from their innermost convictions. These are great aids in the proper execution of as difficult task as reconciling a patient to the lack of salt or to the monotony of rice. However, it should be possible for the investigator to reproduce the exactitude of detail in a manner more rigidly suitable for control, wherein suggestion cannot be said to have influenced the results or their interpretation. An excellent study just published (48) has demonstrated that rigid salt restriction resulted in a slight decrease in the "resting" blood pressure in six hypertensive patients. No change was noted in the "casual" blood pressure, and no therapeutic significance is claimed for the results of this relatively acute experiment. The place of the low-sodium diet in the treatment of hypertension is yet to be established, and much careful work will have to be done. We certainly know that some cases fail to respond to this treatment. We also know that some cases will respond favorably to almost any type of rational treatment. At present, the trend seems to be toward a greater and greater degree of salt restriction.

There are several reasons why a low-sodium diet is difficult to administer, and these become more important as the salt is restricted to greater degree. A low-salt diet containing 2 to 3 gm. of sodium chloride (49) (and often incorrectly termed a "salt-free" diet) is effective in preventing accumulation of sodium. It will continue to find usefulness where the desire is to limit the sodium intake slightly. Usually it is correctly prepared and served and succeeds except for two minor points: First, the diet as ordered is restricted in seasoning, other than salt, and this may defeat the primary purpose of dietary therapy—to have the patient eat. Second, somehow the patient occasionally gets a salt shaker on his serving tray and in about half of such cases he uses it.

Rigid sodium restriction becomes a difficult and individualized task. It requires a maximum of effort and cooperation to provide a daily diet of less than 0.4 gm. of sodium (less than 1 gm. of salt) which is otherwise adequate and is acceptable to the patient. The first difficulty one finds is with the tables of food composition. Because of the previous attention paid to chloride, some tables give sodium chloride values which are based upon chloride analyses (50–53). This is false and gives no true idea of the sodium content of these foods. Such tables may approximate by circumstance the sodium values but should not be used for any sort of strict control and, therefore, they should be removed from our dietary tables and books. The difficulty of doing frequent and numerous sodium analyses, the variation in sodium content of representative market samples, and the lack of information upon the effect of prepa-

ration all make one hesitate before accepting the accuracy with which the sodium content of a given diet may be predicted from a set of tables, even when values are based on sodium analysis. The calculated sodium may vary 50 or more per cent (54–57), depending upon which set of tables one chooses. This necessitates even more rigid selection of low-sodium foods to insure that any error is on the positive side.

Of course, food must be prepared without any salt, and this means individual preparation. The bread must be baked of "salt-free" ingredients, and the butter must be washed free of its salt. Diets both low in protein and low in sodium are not too difficult to construct, but to provide more than 50 gm. of protein taxes one's ingenuity. At Michigan, the problem is approached by the use of peanuts, naturally low in salt, and without using milk (47). Grollman (45) dialyzed the salt from milk. This chore has been lessened by the development of a low-sodium reconstituted milk which has now been placed on the market (58). It, therefore, is possible by one means or another to devise a diet which on paper does not appear too bizarre, in which sodium has been restricted to less than 0.4 gm.

But the task is not done. The next step is to get the patient to eat this diet. This may appear to be no more difficult than with any special diet except that a low-sodium diet is, to most people, extremely tasteless and unappealing. The flavorlessness of unsalted food can be greatly overcome by providing seasonings to suit the patient's choice, if a determined effort is made in this direction. This requires the skillful use of a varied supply of low-sodium seasonings and flavors. The sodium content of most condiments is either low, or in the amounts used in food preparation, is insignificant. As used in the dietary the pharmacologic action of these substances is usually mainly or entirely a local one, although the group contains substances of diverse nature. For many seasonings, no information exists as to their effect, if any, upon the heart, the circulation, and the kidneys. When active principles are present, the effective dosage is many times greater than the amounts administered in food. Modern texts on nutrition, dietetics, and the chemistry of food (57, 59) generally accept without critical comment the idea that condiments should be omitted from the dietary of the patient with heart or kidney disease, along with the equally false idea that tea, coffee, and alcohol should be forbidden. One finds in these books little or no mention of what harm to the heart or kidneys might result from the use of these items. Authoritative pharmacology and toxicology texts (60–62) do not mention, or if mentioned, do not consider any of the following as injurious to the heart or the kidney: allspice, anise, bay, caraway, cinnamon, celery seed, clover, curry, dill, extracts of almond, lemon, vanilla, horseradish, garlic, ginger, mace, mustard, nutmeg, onion, paprika, pepper (green, red, black, or cayenne), pimento, and vinegar.

Needless to state, seasonings prepared with salt should be avoided. This includes celery and other salts, catsup, chili sauce, prepared horseradish or mustard, soy sauce, and Worcestershire and other steak sauces. Salad dressings must be prepared without salt.

In the necessary task of fitting the low-sodium diet to the particular patient's need, an understanding of the food habits and flavor preferences of the patient and the ability of the cook or dietitian to handle condiments and season foods judiciously will be invaluable. The experiences of earlier advocates of salt restriction have been collected and published as hints and recipes (63–65).

Custom and traditional prejudice have condemned the sick to punishment by the removal of seasonings. In the treatment of heart and kidney diseases particularly this has been true, and it is most unfortunate that this attitude, "shrouded in the semi-sanctity of a long and venerable heritage," has never been unveiled to the light of critical evaluation. To my mind there is no basis, either physiological, social, or moral, for withholding condiments as such, from the patient with cardiac or renal disease, provided one is but sensibly cautious not to provoke gastrointestinal distress.

It may be appropriate to emphasize the fundamental importance of the dietary as a necessary medicine and a psychological factor in the treatment of illness. To our highly conditioned adult patient, the benefits of any diet are likely to be substantially lessened if food is not served to him at the proper time and temperature, does not appear attractive to his eye, or is not pleasing to his palate.

Salt substitutes will assist in adding palatability to the diet. There have been a number of so-called salt substitutes on the market dating again to the chloride concept, and these must be carefully avoided since they contain sodium. In keeping with our emergence into the era of sodium ascendency, we can now obtain a commercial sodium-free salt substitute[2] which is compounded of ammonium and potassium chlorides with citrates and formates. A simple mixture of ammonium and potassium chloride is easily made and has long been used with moderate success.

After the diet is prepared and after the values for the portions eaten have been charted and summarized, two steps yet remain. It is most essential to determine that the charted food intake represents the sole source of the sodium received. This is where the best laid plans often go astray. Was salt given—perhaps inadvertently placed on the tray by the serving maid? Can this matter be double checked except in a metabolic unit? Does the patient receive food from other patients or from relatives or well-

[2] "Neo-Curtasal." Winthrop Chemical Company, New York.

meaning friends? A bag of salted nuts, a supply of "Ry-krisp," or saltines tucked away in a bedside stand or a nightly corned beef sandwich has proved the undoing of more than one low-sodium regime. Is there any sodium being administered to the patient in his medication or his diet? The doctor must be well aware of the common use of sodium salts in medicine and must have substitutes available. A transfusion contains over 2 gm. of salt and, of course, saline is to be avoided. The dentrifice or mouth wash may contain appreciable sodium as chloride or bicarbonate. Even the drinking water may supply appreciable sodium (58).

Finally the proof of the accuracy with which this diet is given lies in the analysis of the daily urinary output of sodium. Chloride figures will not underestimate this value, it is true, but it is hoped that newly developed analytical methods will permit convenient and rapid determination of sodium, the same methods that should assist us in analyzing more correctly for the sodium in the diet.

It would seem best that the most severe restriction of sodium for hypertension remain an experimental procedure for the present. Certainly it has not proved to be of lasting benefit in hypertensive disease. The sodium content of the experimental diet of Kempner is estimated to be less than 0.2 gm., of Grollman, 0.25 gm.; and of the University of Michigan .33 gm. However, the severity of this restriction is not necessary in the treatment of most patients with edema. One must continually bear in mind the real risk of sodium depletion present in these restricted diets, particularly when sodium lost through sweating becomes appreciable. Inadequacies in the vitamin and mineral content of these restricted diets are almost the rule. Physician and dietitian must collaborate to insure that the patient's needs are met by intelligent supplementation whenever necessary. Between the customary moderate-salt regime (49) and a Spartan "minimal sodium diet" just discussed, there is room for a wide range of sodium restrictions. It should be the physician's role to use superior judgment in prescribing diets containing less than 0.8 gm. of sodium (that is, less than 2 gm. of sodium chloride), establishing thereby a sharp line between restriction and what amounts to the essential interdiction of salt. When restriction is indicated, the physician should make clear to the patient, to the dietitian, and to the hospital personnel involved in the care of the patient the degree of this restriction, point out its importance, and realize the problems it may impose upon the care and activities of the patient and the management of the dietary department.

In concluding, only mention will be made that the principles underlying the restriction of sodium in the treatment of edema and any possible advantage of its restriction in hypertension serves to reinforce the customary taboo of salt in efforts at prevention, and in treatment of, certain toxemias of pregnancy, particularly eclampsia (66). In Ménière's syndrome a diet low in salt was advocated (67). There has been no verified explanation for its use, and equal or superior results are claimed from the use of a normal diet plus potassium salts (68). Reports of the benefit of salt restriction in psoriasis and tuberculosis of the skin (69) offer little to justify their publication.

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# The Nutritonist's Role in a Diabetes Control Program[1]

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DIETETICS is of utmost importance in any consideration of diabetes as a public health problem—both in the prevention of the disease itself and in the therapy which helps to prevent its disabling consequences. The value of optimum nutrition cannot be overemphasized in the prevention of disease. In diabetes, however, selectivity in diet is all important.

Almost inevitably the result of overeating is overweight, and overweight to the point of obesity has been observed so often as a precursor of diabetes that evidence points to a close relationship between the two conditions. Joslin (1) has emphasized this point repeatedly and, many clinical authorities including Barach (2) and Wilder (3) cite the records of thousands of successive diabetics for illustration. Investigators do not agree on a direct cause-and-effect relationship between obesity and diabetes; nor have they been willing to lay the blame on any specific kind of food except insofar as it contributes to excessive caloric intake. Even with limitations on our knowledge, it appears that the single most valuable and acceptable measure for prevention of diabetes is the avoidance of overweight.

For prevention it is helpful to know what groups are most susceptible to diabetes. First, there is scientific evidence, fairly generally accepted, of a hereditary tendency in diabetes, so that blood relatives of diabetic patients are thought to be more susceptible according to Mendelian ratios of the recessive type of heredity (4). The disease is more likely to occur in those over forty-five years of age and somewhat more likely to select women. If it were possible to describe a composite picture of the most likely candidate for diabetes, an example is afforded by Helen Hokinson's ladies—undeniably over forty-five, more than pleasingly plump, ardent members of various groups but leading an essentially sedentary life, and indulging in food as a recreational outlet on all social occasions.

Lest too much attention be directed toward the women, it should be pointed out that when tests for diabetes have been given to selected groups of men —for example, a large groups of selectees in Massachusetts during the recent war—the prevalence of diabetes was found to be unsuspectedly high (5, 6). Nor should diabetes be considered a disease of old age. Joslin (1) and Barach (2) both show that the disease makes its appearance at all ages, but most commonly between the ages of fifty and fifty-five. The considerable incidence of diabetes in childhood, adolescence, and early adult life, as well as the declining susceptibility in the later decades, indicates that the disease should not be considered a manifestation of senility.

Only through widespread public knowledge of the nature of diabetes and its predisposing factors can progress be made in its prevention. According to Best (7), co-discoverer with Banting of insulin, prevention is the most important aspect of diabetes from the public health standpoint. Thus an important part of a control program in diabetes is educating the public concerning known preventive factors in the disease. More people should know the importance of avoiding obesity and the susceptibility to the disease of relatives of diabetics.

Joslin (1) has emphasized that we should control diabetes wherever possible by focusing on the diabetic family for prevention of the disease and focusing on the patient for prevention of its complications. At least we should avoid some of the worst complications by early diagnosis. If we understand the nature of diabetes, the importance of finding cases early will become apparent, for it is then that they can be most successfully treated.

Diabetes is a chronic metabolic disease in which the pancreas does not produce enough insulin or the effectiveness of insulin is blocked so that the patient cannot utilize all of his food intake. Much of the food, particularly the carbohydrate, changes to glucose, which accumulates to excess in the blood and tissues and consequently is lost through the kidneys. Early diagnosis can be considered a form of preventive medicine, since in experimental animals there has been evidence which indicates that

[1] Presented at the 30th Annual Meeting of the American Dietetic Association in Philadelphia, on October 16, 1947.

early pathological changes in the insulin-producing cells of the pancreas are reversible (7–10). Human subjects with diabetes may not be entirely comparable with experimental animals made diabetic, but no one can gainsay the need to attempt prevention in susceptible human beings. Since it is believed that delayed diagnosis increases liability to serious progression and to the onset of certain dangerous complications, early discovery and prompt and aggressive therapy appear to be of prime importance for the prevention and control of diabetes.

For better public health control of diabetes, there must be a greater realization by the public and the members of the medical profession of the prevalence of the disease and the importance of early diagnosis.

In conducting a community study of diabetes in Oxford, Massachusetts (11), the U. S. Public Health Service had these aims in view:

(a) To discover early cases of diabetes.

(b) To refer potential and newly discovered cases of diabetes to their family physicians for further study and prompt treatment when indicated.

(c) To emphasize to the public the need for periodic laboratory and physical examinations for signs of unsuspected disease.

(d) To evaluate the techniques and methods of large-scale diagnostic screening for diabetes.

(e) To determine the prevalence of diabetes in a typical American community.

(f) To determine the significance of diabetes mellitus as a public health problem.

With the cooperation of the medical profession, the community leaders, and the townspeople, the staff tested 70 per cent of the 4983 residents in Oxford.

The technique of the survey consisted in obtaining specimens of urine and venous or capillary blood from the people about an hour after an average morning, midday, or evening meal. In most cases, a dietary record of this meal was taken to determine if it contained sufficient carbohydrate to make the test valid.

Among the supposedly non-diabetic population on the first test, 191 showed sugar in the urine, an excessively high blood sugar level, or a combination of both conditions; these received a second test for urine and blood sugar. A total of thirty-nine glucose tolerance tests were given to those whose first and second tests did not agree, whose tests were "borderline," or who showed one abnormal condition without the other. More detailed information may be found in the complete report of the study (10).

From the testing program, thirty previously undiagnosed cases of diabetes were found plus twenty-five cases of unclassified glycosuria or hyperglycemia. The patients were notified of an "abnormal condition" and advised to see their family physicians, who were sent the results of the laboratory tests. In addition to the thirty newly discovered diabetic cases, there were found to be forty people in Oxford already under treatment for the disease. These patients appeared glad of the opportunity to have a blood and urine sugar test, the results of which they were told would be forwarded to their physicians. Thus there were seventy individuals with diabetes out of the 3516 tested. If one projects the figure for the untested cases on the basis of the observations in the tested cases, about 1.7 per cent of the Oxford population were found to have diabetes.

In the study the disease was found to be only a little more prevalent among women than men. While there were four cases under age thirty-five and nine from thirty-five to forty-five, the fifty-seven other cases were over forty-five years of age. It seems significant that the age distribution of the population of Oxford is very similar to the age distribution of the whole country. This is an important fact, because if Oxford had a larger proportion of older people, we would naturally expect diabetes to be more prevalent.

It should be of interest to those concerned with nutrition that the occurrence of overweight at some period of their lives was reported by most of the diabetic persons in Oxford. At the time of their maximum weight, twenty of the thirty-one men and thirty of the thirty-nine women had been between 5 and 45 per cent overweight.

The adherence to prescribed diet in the cases of known diabetes under treatment was not determined in great detail. Seven apparently followed a rigid diet. The most commonly reported description of diet was "restricted." Nine reported the practice of no dietary restrictions or negligible ones, such as "no sweets." Evaluation of the findings among the known diabetic patients under treatment generally indicated a need for a better understanding of the disease by the patient and the importance of following the regime prescribed by their attending physicians.

The survey in Oxford concretely illustrates what other investigators have suggested—that concerted testing programs to find cases of diabetes will produce results. If there are three undiagnosed cases of diabetes for every four under treatment—as was the case in Oxford—it is to the community's interest that those unknown cases be discovered as early as possible.

The work of case-finding and education of the public is being extended by the U. S. Public Health Service through the local health departments of two communities—Brookline, Massachusetts, and Jacksonville, Florida. In cooperation with the local health department in these locations, diabetes demonstration programs are being conducted by a professional staff specially trained in the management of diabetes. The Public Health Service Unit consists of a physician, a public health nurse, a

nutritionist, a health educator, laboratory technicians, and clerical workers. A medical advisory committee composed of local physicians and a lay committee of public spirited citizens assist in formulating policies for the program.

There is an appeal to the nutritionist to organize programs for the education of the diabetic patient, a very essential phase of diabetes control. It means instilling the principles of good nutrition in a group who, in most cases, literally cannot live without it, and who are anxious for the knowledge which will mean a happier and healthier life for them.

What, then, is the specific role of the nutritionist in the local diabetes control program? Primarily the diabetes nutrition service is planned to provide a demonstration of methods which may be used in dietary education of diabetic patients, individually or in groups. The Public Health Service offers assistance to the physician in the dietary instruction of any diabetic patient he refers to them. Individual interviews are given in order to interpret and illustrate the physician's dietary prescription. Group instruction on diabetic diets and normal nutrition for the patient is also offered. In connection with this work, the nutritionist provides and demonstrates the usefulness of visual teaching aids. For example, she illustrates her lectures with films, food models, posters, and so on.

The nutritionist cooperates closely with physicians, nurses in hospitals, and health departments to stimulate interest in simplified methods of instruction, in the preparation of visual aids, and in ready sources of information on diet. In the field of professional education, the nutritionist will participate in the field training of public health students and in the orientation and in-service training of the staff of the health agency. Topics in the training course will include a simplified method of calculating diabetic diets, a working knowledge of human food needs, and methods of improving the nutritional status of the diabetic patient and his family.

It cannot be emphasized too often that the education of the diabetic patient is essential for successful control. The patient must know what diabetes is and how it affects him, the relation of diet and recreation to the course of the disease, the essentials of normal nutrition, how cooking and preparation affects food value, and the specific dietary requirements in his own particular case as prescribed by his physician.

The first step in education is to supply the patient with adequate motivation to learn more about the disease and to accept responsibility for the care of his own health. Unless the patient understands the reasons for harmonizing the requirements of diet, insulin, and exercise in his daily routine and knows the importance of regular examination and observation by his physician, he may not be willing to undergo the inconvenience necessary for well-being and acceptance of a life-long limited restriction on his daily living.

The U. S. Public Health Service has initiated its first program in supplementing the education of diabetic patients in Jacksonville, Florida, in cooperation with the state, county, and city health departments. This program has the endorsement of the local medical society, and the medical advisory committee reviews the plans, procedures, and the educational material used.

First it was arranged for classes to be held in the county hospital. Letters were sent to all practicing physicians in the county informing them of the classes and proposed plans. A newsletter with an invitation to attend the class was next sent to several hundred people who were known to have diabetes and who had been referred by a hospital, clinic, or attending physician. In order that the first classes might be kept small, no other publicity was given to the first series. In all, eighty persons attended one or more classes of the group. Prior to the second series of classes, a certain amount of radio and newspaper publicity was released in addition to a regular monthly newsletter. A hundred white and thirty-five Negro patients appeared for the first class of the second series. The plan as developed so far is to give a series of nine classes, two classes each week, each class lasting 1 to $1\frac{1}{2}$ hr.

One of the classes is scheduled to be taught by the physician, three by the nurse, and five by the nutritionist. In the first class, the physician stated, in effect: "The information which we are giving in these classes is based on that given to the patients in the large diabetes clinics in the country. However, if it conflicts with what your doctor tells you, do as he says. Your doctor knows your own particular case much better than anyone else and can advise you more accurately. We cannot advise you as to the type or amount of treatment you should have. We can only interpret your doctor's orders to you."

It is hoped that, as a result of these classes, the patients will have as a part of their usable knowledge these concepts:

(a) Regular visits to the family physician for observation and examination yield dividends.

(b) Heredity and obesity are believed to be predisposing factors in the occurrence of diabetes.

(c) It is essential insofar as possible for the diabetic patient to maintain blood sugar levels within certain normal limits.

(d) The diabetic diet is similar to the normal diet which everyone should eat.

(e) Most foods contain some sugar, and a person who has diabetes needs sugar in the correct amount.

(f) To remain healthy and happy one should maintain resistance to infection by healthful and clean living and by the exercise of simple rules of oral and bodily hygiene.

(g) The patient is to a great extent the captain of his own ship. To profit from the instructions of his physician, he must learn to manage his own condition by a sensible daily routine.

(h) When in doubt about his health, the patient should see his family doctor.

(i) Insulin is a potent, life-giving drug and should be administered carefully and strictly in accordance with the attending physician's directions.

In many hospitals and clinics the group teaching method is utilized to advantage. In recognition of the fact that each patient has something to contribute, an informal teaching method is used in the Jacksonville classes, with a discussion period for questions and answers by the patients concerning their own problems. The short discussion by the teacher is supplemented by films, slides, food models, posters, and use of the blackboard.

Food models are used to show exchanges or substitutions for the basic foods. The use of illustrative materials and models helps to stimulate the patient's enthusiasm about his daily diet. Each class on diet is summarized by group participation in menu adjustment of these basic and equivalent foods to the patient's diet.

It is probably too early to evaluate the results of the classes, but some criteria to be used will be: (a) whether or not the patient has a cheerful attitude about his disease and has adjusted himself to its requirements, and (b) whether he is following a proper diet and complying with his physician's instructions, including insulin therapy.

Individual reactions do demonstrate appreciation of the classes. One woman read of the classes in the newspaper and came 75 mi. to attend, planning to return twice weekly for the series. One Negro patient remarked, "I don't feel such a diabetic since you told us the different foods we can eat."

In the classes, it was found that lack of appeal is one of the most common causes of breaking the diet. Throughout the diet classes an attempt was made to emphasize the "art of diabetes" through group discussion of the exchange lists. Variety, tasty preparation, and consideration of the likes and dislikes of the patients are essential considerations. Frequent menu making, using the family's favorite foods, as well as planning menus for a restaurant or for a picnic or box lunch gives the patient confidence to attend social functions.

Occasionally upon the request of attending physicians the nurse makes home visits, during which instruction and help are given in diabetic care and diet.

It is believed that the classes for diabetic patients will open new educational avenues of approach to their families and to the general public. Because of the hereditary factor in diabetes, these classes can be helpful in case-finding. Persons with diabetes are aware of the symptoms of the disease and the need for early diagnosis. With knowledge of the arrangements for testing, they are helpful in encouraging relatives to have the tests made.

Keeping in mind the idea of a community nutrition program, the nutritionist has an opportunity not only to teach the diabetic diet but also to teach basic nutrition to the diabetic patients, their families, and friends. Members of the patient's family are encouraged to attend the classes, since pleasant, understanding, and cooperative family relationships influence the acceptance of the medical and dietary regime.

There still remain problems in the nutrition service designed for the diabetes control program. One problem which exists in the calculation of the diabetic diet is the variation in food tables and exchange lists. Each food clinic has worked out the method which proved best in a particular situation. In Jacksonville the problem of coordination of food tables was placed before the local dietetic association. The hospital dietitians met weekly and prepared a revised diet booklet and standard menu plans. The revised list was then presented to a group of local physicians particularly interested in diabetes, who accepted it for use in the hospital and for distribution to practicing physicians who might wish to use it among their patients. As a result, the same basic figures, classifications, exchange lists, and method of calculating the diabetic diet are used fairly generally for instruction throughout the city and county. This saves a great deal of confusion for the diabetic patient who moves and has to change his physician. Future meetings are planned with the hospital dietitians to pool ideas on the educational materials and methods which can be used for the diabetic patient.

There is a need for cooperation between medical and public health groups and other agencies interested in diet for the diabetic. Many physicians do not have time to give detailed dietary instruction and have stated the need for dietary lists A simple method of calculating diets and writing menus is needed in an easily usable form for the busy practitioner

The U. S. Public Health Service Demonstration Units which conduct diabetes control programs are set up with the plan that eventually the local health departments will take over the programs. It is believed the benefits of education of the general public, the case-finding efforts, and the aid which is offered to the physician in the education of the diabetic patient will decrease the total of disability, unhappiness, and economic loss which uncontrolled diabetes engenders. Even when nutrition education programs are conducted on a small scale, their beneficial results may multiply far beyond the group receiving the initial effort, for they will be a means to community education.

SUMMARY

1. For better public health control of diabetes, there should be a greater realization by the public and by members of the medical profession of the prevalence of diabetes, the known measures of prevention, and the importance of early diagnosis.

2. Avoidance of obesity, especially for those with a family history of diabetes, is important in the prevention of the disease. Avoidance of complications, through periodic examination, insures the best prognosis in the disease.

3. A study of diabetes mellitus based on case history, urine and blood sugar tests, and dextrose tolerance tests was made by the U. S. Public Health Service on 3516 persons in Oxford, Massachusetts, a typical American town. This number represents 70.6 per cent of the entire population of 4983. A total of seventy cases of diabetes was found—forty cases previously known and thirty discovered during the survey, indicating a prevalence of about 1.7 per cent. For every four previously known cases, there were three hitherto undiscovered cases. The large ratio of new to known cases indicates a probable prevalence of diabetes in the United States higher than that hitherto reported.

4. The work of case-finding and education of the public is being extended by the U. S. Public Health Service through the local health departments of two communities—Brookline, Massachusetts, and Jacksonville, Florida.

5. In the local diabetes control program, the physician, the nutritionist, and the nurse plan and execute methods which may be used in dietary education of diabetic patients.

6. The nutrition service for diabetic patients offers assistance to the physician in the dietary instruction of patients referred to the local health agency for instruction concerning their disease.

7. In addition to teaching individuals, the nutritionist offers group classes on the diabetic diet.

8. The nutritionist cooperates closely with physicians, nurses in hospitals, and health departments to stimulate interest in methods of instruction in diabetic diets.

9. The U. S. Public Health Service has initiated its first program in supplementing the education of diabetic patients in Jacksonville, Florida. This work is planned with the assistance of the local medical society and city, county, and state health departments. In the first series of classes, eighty persons attended one or more classes. The second series of classes has begun with 135 patients in attendance. An informal teaching method is used, with a discussion period for the patient. It is believed that these classes for diabetic patients will open new avenues of approach to the education of the patients' families and the general public.

10. In Jacksonville, the problem of simplification of basic food values and method of calculation were placed before the local dietetic association. Mutually interested groups prepared a revised diet booklet and standard menu plan.

11. The U. S. Public Health Service Diabetes Demonstration Units are planned to show the practicability of diabetes control programs for local health departments.

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### *Frozen Food in England*

In England, where the potentialities of frozen food are still in the "revolutionary" development stage, it is called "frood." Last year, for the first time, a three-course frozen meal was sent from London to Skegnes, 130 mi. away, for a luncheon. As a result of this demonstration, the Ministry of Food became definitely interested in "frood," and has sanctioned an arrangement whereby hotels, boarding houses, camps, hospitals, and other institutions may transfer their allocations of rationed food to the processing firm which would cook and deliver or store the finished meals.—*Institutions Magazine, September, 1947.*

# Nutritional Status of Children

## III. Blood Serum Vitamin C[1]

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VITAMIN C[2] has been known longer and studied more extensively than any of the other vitamins. The amounts of vitamin C necessary to protect human beings against scurvy at various age levels (1) have been established for practical purposes, and therapy for conditions of vitamin C deficiency is well defined. However, the adequacy of diets with respect to vitamin C is of particular interest to dietitians because the vitamin must be furnished by the current food intake of a human being, inasmuch as there is little, if any body capacity for either synthesis of the material or for storage. Furthermore, the lability of vitamin C in food materials to destruction by unfavorable methods of storage, preparation, and cooking (2) results in wide discrepancies in the antiscorbutic value of raw foods and the same foods, as eaten. Knowledge of the many functions of vitamin C in cell chemistry and physiology and recognition of the occurrence of mild deficiency states without clinical symptoms have emphasized the adverse effects which may result from suboptimal intakes of the vitamin.

The importance of vitamin C in regulating normal cell function has been known in a general way for many years, as has its role in the formation of intercellular cement substances. More recently, very specific functions of vitamin C have been brought to light which explain, in part at least, the unique role of this food substance in body economy. Levine, Marples, and Gordon (3), in work with human infants, and Sealock and Silberstein (4), in work with guinea pigs, have demonstrated that the amino acid tyrosine is not metabolized in a normal manner during vitamin C deficiency. More recently, Long (5) has demonstrated that vitamin C may have a unique function in the formation of the steroid hormones of the adrenal cortex, under the stimulus of the adrenotropic hormone of the pituitary gland. Since the tissues of the young growing organism are richer in vitamin C than adult tissues and tissues of high metabolic activity are characterized by a high-vitamin C content (6), one might infer that this substance has additional significance in the nutrition of children. Ames and Nungester (7) have shown that the phagocytic activity of the white blood cells is dependent upon an adequate vitamin C concentration in the plasma in which the cells are suspended, and that 0.7 mg. per 100 cc. is the minimum concentration consistent with maximal activity.

A great deal of work has been done upon the vitamin C content of blood in human subjects, and although all problems relating to the question of the limits of blood concentration that can be considered normal or optimal have not been solved, there does exist a fair definition of such standard values. Serum vitamin C levels tend to reflect recent dietary intake levels (8–10); therefore, in the present study blood samples were taken only following a night fast of 12 hr. or more. In this way the effects of recent intake of vitamin-C-rich foods were minimized, and the levels observed become a more valid representation of nutritional condition. Validity in interpretation of the results is attained in the present study as it deals with the vitamin C blood levels of many children included in a survey. Although doubt may exist when the vitamin C content of a single blood sample is taken as the criterion of vitamin C saturation in an individual, the overall picture obtained in a survey is of greater reliability in revealing the nutritional status of a large group. Since the children at each institution lived under conditions of quite regular habits and dietary regimen, the day-to-day variability might be expected to be minimal as compared with groups whose dietary pattern is more erratic.

The ages and number of children included in each group of the present survey, the times at which successive studies were carried out, pertinent facts relating to the environment of the different groups, and

[1] Received for publication December 26, 1947.

[2] The term "vitamin C" has been applied to results obtained in this laboratory by methods which determine greater vitamin C activity than would be found by using methods which determine only ascorbic acid.

the height, weight, and growth records of the children have been presented (11).

In using blood levels of vitamins as indices of nutritional status, the greatest difficulties lie in our inadequate knowledge of the concentrations which define the zones of nutritional adequacy or inadequacy. However, the great amount of research conducted on blood vitamin C has provided more definite knowledge of the desirable blood levels of this constituent than is available for any of the other vitamins. György (12) summarizes current opinion in stating: "The normal level for ascorbic acid in human blood plasma is 0.7 mg. per 100 cc." He reports that blood levels below this may be interpreted as indicative of insufficient intake or increased body demand as in infection, an actual deficiency, or tissue undersaturation. Youmans (13) states that normal concentrations of vitamin C range from 0.7 mg. per 100 cc. of serum upward, with concentrations of 1.2 mg. per 100 cc. or better being commonly observed in well nourished subjects. He considers values in the range of 0.4 to 0.7 mg. per 100 cc. as constituting the borderline region and values below 0.5 or 0.4 mg. to be definitely deficient. Similar opinions are expressed by Farmer (14), Adamson *et al.* (15), Borsook *et al.* (16), and others, although Farmer warned that the finding of a level of 0.0 to 0.4 mg. per 100 cc. need not be interpreted in any individual as being indicative of severe deficiency unless the low level was observed in repeated examinations.

Table 1 summarizes the results of a few surveys of the serum and plasma ascorbic acid of children. It is apparent from such data that a rather substantial number of children in any population may be expected to have reduced blood levels of ascorbic acid and that the distribution of these will be dependent upon factors of season, geographic locality, and economic level.

TABLE 1

*Blood serum or plasma vitamin C levels recorded in the literature for American children*

| LOCATIONS | NUMBER OF CHILDREN | AGE OF CHILDREN | CRITERION OF ADEQUACY | PERCENTAGE OF SUBJECTS DEFICIENT | REMARKS |
|---|---|---|---|---|---|
| | | *yr.* | *mg./100 ml.* | | |
| Tennessee (17) | 380 | 1–15 | 0.7 | 61 (spring)<br>45 (summer) | Normal, healthy |
| Maine (18) | 86 | 7–16 | 0.6 | 69 (fall)<br>85 (spring) | Normal, healthy |
| | | | 0.4 | 46 (fall)<br>63 (spring) | |
| Cincinnati (19) | 69 | | 0.5 | 15.9 | Living in orphanage, healthy |
| | | | 0.25 | 5.8 | |
| North Carolina (20) | 34 | 5–17 | 0.7 | 88 (before)<br>12 (after) | Summer camp, white, colored, before and following dietary adjustment |
| | | | 0.4 | 71 (before)<br>0 (after) | |
| | | | 0.2 | 50 (before)<br>0 (after) | |
| New York City (21) | 342 | high school | 0.6 | 6 (winter) | High economic level |
| | | | 0.4 | 3 (winter) | |
| | 425 | high school | 0.6 | 50 (spring) | Low economic level |
| | | | 0.4 | 32 (spring) | |
| Philadelphia (22) | 1185 | grade school (mostly fifth) | 0.7 | 42 | Urban, healthy, from all economic levels |
| | | | 0.5 | 22 | |
| | | | 0.3 | 16 | |
| Michigan (23) | 207 | 9–12 | 0.7 | 64 (winter) | Rural and small urban communities |
| | | | 0.3 | 34 (winter) | |
| Tennessee (24) | 226 | 1–15 | 0.7 | 24 | White, rural |
| | | | 0.3 | 4 | |
| Vermont (25) | 350 | grade school | 0.6 | 29 (fall)<br>70 (spring) | |
| | | | 0.3 | 11 (fall)<br>28 (spring) | |
| Mexico City (26) | 181 | 2–16 | 0.65 | 16 | |
| | | | 0.45 | 10 | |
| British Columbia (27) | 1652 | 5–11 | 0.4 | 40 (winter) | |
| Saskatchewan, B. C. (27) | 1465 | 5–19 | 0.4 | 56 (spring) | |

## METHODS

Fasting blood samples were collected from finger tip punctures by the method of Bessey and Lowry (11). Serum was prepared from these samples for determination of vitamin C by the micromethod of Lowry, Lopez, and Bessey (28) with some modifications described by Bessey, Lowry, and Brock (29). The reproducibility of the micromethod for blood vitamin C when employed with duplicate samples from 178 representative subjects is shown in Table 2. Of the duplicates, 61 per cent deviated by less than 0.1 mg., 86 per cent by less than 0.2 mg., and 95 per cent of the cases showed deviations of less than 0.3 mg. per 100 cc. of blood serum, demonstrating the accuracy of the technique in the assessment of nutritional status.

TABLE 2

*Reproducibility of vitamin C determination in 178 duplicate blood serum samples*

| SERUM VITAMIN C LEVEL | NUMBER OF DUPLICATE DETERMINATIONS ACCORDING TO DIFFERENCES BETWEEN THEM | | | | |
|---|---|---|---|---|---|
| | 0.0–.10 mg./100 cc. | .10–.20 mg./100 cc. | .20–.30 mg./100 cc. | .30–.40 mg./100 cc. | .50–.60 mg./100 cc. |
| *mg./100 cc.* | | | | | |
| 2.40–2.60 | 1 | | | | |
| 2.20–2.40 | 1 | | | 1 | 1 |
| 2.00–2.20 | | | | | |
| 1.80–2.00 | 2 | 1 | 2 | 1 | |
| 1.60–1.80 | 12 | 3 | 2 | 1 | |
| 1.40–1.60 | 10 | 5 | 3 | 1 | |
| 1.20–1.40 | 20 | 10 | 4 | 2 | |
| 1.00–1.20 | 12 | 3 | 2 | | |
| .80–1.00 | 15 | 6 | 2 | | |
| .60– .80 | 8 | 3 | 2 | | |
| .40– .60 | 11 | 5 | | 1 | |
| .20– .40 | 4 | 5 | | | |
| .00– .20 | 13 | 3 | | | |
| Number of differences... | 109 | 44 | 17 | 7 | 1 |
| Percentage of total..... | 61 | 25 | 9 | 4 | 1 |

The accurately weighed composites of food consumed at the Holy Family Orphan's Home by four representative children during seven consecutive days in the fall and a like period in the spring (11) were analyzed for vitamin C by the method of Bessey (30), which determines both ascorbic acid and the significantly potent antiscorbutic substance, dehydroascorbic acid. Smythe and King (31) and Miller (32) have discussed in detail the shortcomings of the hydrogen sulphide reduction procedure when applied to vitamin C estimation. Interference by reductones which resemble vitamin C in reaction but have no vitamin C potency are particularly troublesome in certain dehydrated foods and foods prepared at high temperature and alkaline *p*H. The diets examined in this study did not contain large amounts of such foods; however, the figures presented must be interpreted in the light of the recognized hazards which at the present time beset all chemical methods for vitamin C estimation.

## RESULTS

The distribution of the children in the five groups according to the levels of vitamin C in their blood serum is shown in Table 3. Values obtained at different seasons and for Negro children are shown separately. Correlations of the values for vitamin C in the serum with the levels of vitamin A, carotenoids, or serum alkaline phosphatase did not show significant relationships, nor did sex, age, or weight of the subjects appear to be related to vitamin C concentration in serum. The lack of correlation with hemoglobin concentration is in agreement with the results of Holmes, Cullen, and Nelson (19) in a study of 118 children, and with those of McMillan and Todhunter (33) in a study of college women. However, a relation between vitamin C and hemoglobin levels might be apparent in surveys of groups of individuals in whom the results of serious vitamin C deprivation are encountered.

In distribution of serum vitamin C levels (Table 3) a real seasonal effect was evident for the children at the Children's Village and St. Joseph's Home. This finding is similar to those of other workers (17, 18, 20, 25, 34, 35) and is presumably explained in large measure by the consumption of greater quantities of vitamin-C-rich foods during the summer months than in the winter when such foods are less readily available. Undoubtedly other factors, such as the greater incidence of upper respiratory infections which are known to influence vitamin C requirement, also tend to depress blood vitamin C values during the winter months. The rapid increases in the serum vitamin C concentrations of the children at Bay Cliff Health Camp in response to their greatly improved diets and environment during the camping period is discussed in the following paper.

Of all the groups studied in the fall, the adolescent boys at the Boys Republic had the lowest average serum vitamin C level. Although no observations of that group were made in the spring, if reductions occurred similar to those observed at the Children's Village and St. Joseph's Home, a substantial number of the boys might be expected to be having undesirably low concentrations of serum vitamin C during the late spring months.

While seasonal effect on serum vitamin C as is portrayed in the data for the children was particularly evident at St. Joseph's Home, no seasonal effect was found for the Holy Family Orphan's Home. The children at St. Joseph's Home subsist close to the soil and utilize home-grown produce to a large degree. In addition to rural location, for economic reasons they consume smaller amounts of foods rich in vitamin C during the winter season.

TABLE 3

*Distribution of children according to levels of vitamin C concentration in blood serum*

| LEVEL OF VITAMIN C | NUMBER OF CHILDREN IN METHODIST CHILDREN'S VILLAGE | | | NUMBER OF CHILDREN IN HOLY FAMILY ORPHAN'S HOME | | | NUMBER OF CHILDREN IN ST. JOSEPH'S HOME | | | NUMBER OF BOYS IN BOYS REPUBLIC (FALL) | | NUMBER OF CHILDREN IN BAY CLIFF HEALTH CAMP | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fall | Spring | Total* | Fall | Spring | Total* | Fall | Spring | Total* | White | Negro | Initial | Final | Average† |
| *mg./100 cc.* | | | | | | | | | | | | | | |
| 2.2–2.4 | | | | | 1 | 2 | | | | | | 1 | 1 | 1 |
| 2.0–2.2 | | | | | 1 | 1 | | | | | | 2 | 4 | 3 |
| 1.8–2.0 | 2 | | 2 | 1 | | 4 | | | | | | | 10 | 2 |
| 1.6–1.8 | 2 | 1 | 3 | 1 | 5 | 6 | | | | 2 | | 2 | 16 | 6 |
| 1.4–1.6 | 1 | 1 | 5 | 6 | 5 | 12 | 5 | 1 | 6 | 4 | 1 | 2 | 15 | 18 |
| 1.2–1.4 | 5 | 2 | 9 | 16 | 6 | 31 | 10 | 2 | 14 | 10 | 1 | 6 | 20 | 23 |
| 1.0–1.2 | 7 | 4 | 14 | 21 | 14 | 44 | 9 | 5 | 16 | 5 | 2 | 9 | 14 | 14 |
| 0.8–1.0 | 4 | 5 | 15 | 15 | 11 | 37 | 12 | 9 | 25 | 9 | 1 | 8 | 3 | 17 |
| 0.6–0.8 | 6 | 5 | 12 | 6 | 17 | 30 | 2 | 13 | 16 | 3 | 3 | 20 | 2 | 13 |
| 0.4–0.6 | 1 | 6 | 9 | 3 | 9 | 19 | 2 | 7 | 10 | 11 | 1 | 15 | 4 | 3 |
| 0.2–0.4 | 4 | 5 | 14 | 1 | 1 | 2 | | 3 | 3 | 2 | 1 | 13 | | 1 |
| 0.0–0.2 | 2 | 5 | 10 | | | | | | | | | 11 | | |
| Number of children | 34 | 34 | 93 | 70 | 70 | 188 | 40 | 40 | 90 | 46 | 10 | 89 | 89 | 101 |
| Percentage below 0.6 mg. | 20 | 47 | 35 | 6 | 14 | 11 | 5 | 25 | 14 | 28 | 20 | 44 | 4 | 4 |
| Mean | .95 | .68 | .80 | 1.08 | 1.01 | 1.04 | 1.08 | .78 | .93 | .95 | .88 | .72 | 1.42 | 1.19 |
| Standard error of mean | .08 | .07 | .05 | .03 | .05 | .03 | .04 | .04 | .03 | .06 | .12 | .05 | .04 | .04 |

* Total for both spring and fall studies, thus, counting some children twice.

† One value for each child. May be average of as many as four determinations during camp period.

At Holy Family Orphan's Home, weighed composites representing the food eaten by four children were collected during both the spring and fall studies and analyzed for vitamin C. The average daily intakes of vitamin C by the children and the serum vitamin C levels at the same times are given in Table 4. There was no radical change in either the intakes of vitamin C or concentration in serum from fall to spring, and the values indicate that a daily intake of about 60 mg. of vitamin C was consistent with a serum vitamin C concentration of 0.7 mg., or more, per 100 cc. The latter finding is in general agreement with recent studies on vitamin C needs of children. Wilson and Lubschez (36) state that in normal children, intakes of 50 to 75 mg. daily of vitamin C will maintain plasma levels at 0.7 mg. per 100 cc. or above, and they conclude that the recommendations of the Food and Nutrition Board of the National Research Council (1) for vitamin C are not excessive. Roberts, Brookes, Roberts, Koch, and Shelby (37) found 62 to 72 mg. of vitamin C per day adequate to meet the requirements of six- to twelve-year-old girls. Harris (38) believes that the optimum intake for boys eleven to thirteen years of age is not less than 50 mg. per day, and Pemberton (39) suggests that 63 mg. per day will cover the requirement of ten- to fourteen-year-old boys. Working with children forty-three to sixty-four months of age, Hathaway and Meyer (40) found 31 to 50 mg. of vitamin C per day would approximate needs.

During the studies at the Methodist Children's Village samples of serum were obtained on successive

TABLE 4

*Intake and blood serum levels of vitamin C*

| SUBJECT AND AGE (YEARS) | VITAMIN C INTAKE | | VITAMIN C BLOOD LEVEL | |
|---|---|---|---|---|
| | Fall | Spring | Fall | Spring |
| | *mg./day* | *mg./day* | *mg./100 cc.* | *mg./100 cc.* |
| Robert (12) | 56 | 70 | 1.38 | 0.91 |
| Donna (12) | 74 | 71 | 1.07 | 0.77 |
| Leroy (8) | 56 | | 1.05 | |
| Ronald (8) | | 66 | | 1.55 |
| Judy (8) | 57 | | 1.06 | |
| Shelby (8) | | 61 | | 0.71 |

TABLE 5

*Variability of blood serum vitamin C determination on 133 samples from the same children on consecutive days*

| CONCENTRATION LEVEL | NUMBER OF DIFFERENCES ACCORDING TO DEVIATIONS | | | | | |
|---|---|---|---|---|---|---|
| | 0.0–.2 mg./100 cc. | .2–.4 mg./100 cc. | .4–.6 mg./100 cc. | .6–.8 mg./100 cc. | .8–1.0 mg./100 cc. | 1.2–1.4 mg./100 cc. |
| *mg./100 cc.* | | | | | | |
| 1.8–2.0 | 1 | | | | | |
| 1.6–1.8 | 2 | 3 | | 1 | | |
| 1.4–1.6 | 3 | 1 | 2 | | | 1 |
| 1.2–1.4 | 5 | 5 | | 2 | 1 | |
| 1.0–1.2 | 7 | 4 | 2 | 2 | | |
| 0.8–1.0 | 8 | 6 | 2 | 3 | | |
| 0.6–0.8 | 5 | 5 | 3 | | | |
| 0.4–0.6 | 9 | 6 | 1 | 4 | | 1 |
| 0.2–0.4 | 10 | 2 | 2 | | | |
| 0.0–0.2 | 19 | 3 | 1 | 1 | | |
| Number of differences | 69 | 35 | 13 | 13 | 1 | 2 |
| Percentage of total | 52 | 26 | 10 | 10 | 1 | 1 |

days from the same subjects. The day-to-day variability of fasting serum vitamin C in these children (Table 5) was significantly greater than the variability inherent in the micro method. Serum vitamin C concentrations are known to reflect the immediately preceding vitamin C intake to a considerable degree (41), and the day-to-day variations observed in the present study are probably reflections of variations in intake. In a study of five college women, Todhunter, Robbins, and McIntosh (42) observed that a 50-mg. oral dose of ascorbic acid did not increase plasma concentration of vitamin C if the initial fasting plasma concentration was less than 0.5 mg. per 100 cc. It is significant that the children in the present study having levels below 0.4 mg. per 100 cc. showed smaller day-to-day variability in serum vitamin C than did subjects showing higher values.

## SUMMARY

Vitamin C was determined in the serum from fasting blood samples from 384 boys and girls in the care of five Michigan agencies. Spring and fall values are presented separately, as are values for white and colored children and initial and final values for children in a summer health camp.

Correlations of the values for vitamin C in the serum with the levels of vitamin A, carotenoids, hemoglobin, or serum alkaline phosphatase did not show significant relationships, nor did sex, age, or weight of the subjects appear to be related to vitamin C concentration in serum. Seasonal effect was evident in the blood serum vitamin C levels of two groups of children, and concentrations in the blood serum of children attending the health camp increased considerably during the six weeks.

Analysis of weighed composites representing the food eaten by four children indicated that a daily intake of approximately 60 mg. of vitamin C was consistent with a fasting blood serum vitamin C concentration of 0.7 mg. or more per 100 cc.

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## COPPER COOKING VESSELS

On a practical basis, both in industry and in connection with foods and drink, copper cooking vessels provide no major problem under ordinary circumstances. Chiefly this is due to the fact that copper is absorbed from the alimentary tract with difficulty, its chief action being local and associated with frequent emesis and occasional diarrhea. A fair percentage of plumbing represents copper pipes. Thousands of hotels and restaurants make use of copper vessels for cooking in which the customary tin lining has worn away. Copper salts extensively are employed to furnish a bright green color to vegetables, such as peas and beans. Time honored is the use of copper vessels in households for the canning of fruit and vegetables. Out of none of these common usages has experience indicated significant damage from copper. In therapeutics, apart from the use of copper as an emetic, such doses as 30 mg. of copper sulphate several times daily in times past widely have been employed without established damage. Despite the foregoing, it is impossible not to accord to copper a minor role of disturbance. Many of the best hotels and restaurants either have shifted to large cooking units of stainless steel or carefully procure retinning at the first signs of copper exposure. In the manufacture of carbonated beverages, continued effort is exercised to avoid a significant copper content in beverages, since this industry commonly deals with fruit acids, such as citric, along with carbonic acid. Immediate vomiting after drinking "pop" is a fairly common experience. Some persons promptly vomit after the ingestion of some shell fish apart from an allergic state, and apparently some such emesis is due to an unusual copper content. Milk long in contact with copper seems to lead to the formation of copper lactate or possibly butyrate and on occasion may present a greenish tinge. Instead of this being regarded as detrimental, it may represent a slight advantage, since such milk may not "turn" as readily as otherwise. However, this statement implies no high bactericidal value for copper salts. A daily intake of 4 to 5 mg. of copper probably represents the upper limit, although up to 20 mg. has been widely condoned. In water supplies, a maximum limit of 2 mg. of copper per liter is well recognized, although various water works authorities specify a much lower maximum. The lethal dose of copper in the form of its common salts is somewhere near 10 gm., although 1.25 gm. of copper acetate is known to have killed a child. All considered, copper salts may be relegated to a low position as a major poison, but minor disturbances, such as vomiting, nausea, and diarrhea, without lasting results are probably widespread. These occurrences represent one of the common real causes of so-called food poisoning.—*From Queries and Minor Notes, J. A. M. A. 135: 879 (November 29), 1947.*

# Nutritional Status of Children

## IV. Nutritional Conditioning in a Health Camp[1]

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THERE is a real difference between adequate physical status and buoyant health, and summer camp experience is known to contribute to the formation of a nutritionally stable body that is more resistant to disease and to produce a feeling of well-being. Even the person whose general health is considered adequate profits from a change of environment. With children, the stage and symmetry of growth and development serve as criteria of progress in biological time, while muscle tone and the condition of the skin, hair, eyes, mouth, and tongue may reflect general health status. With the development of appropriate biochemical procedures (1) it is possible to make objective determinations of physiological status coincident with clinical examinations and to evaluate the results of changed environment. These procedures have been applied in a study of ninety-nine children six to fifteen years old during their six weeks at Bay Cliff Health Camp (1) on the shore of Lake Superior, about 40 mi. from Marquette, Michigan.

The children who attend Bay Cliff Health Camp are those whose physicians believe that they will benefit physically and mentally from the experience. All are underprivileged, and the camp is organized to provide proper recreational training for special groups, as well as excellent diet in a healthful environment. In a study of the nutritional status of the group, vitamin C[2] was determined in the blood serum of each child two to four times during the camp period of six weeks. In addition, each child was examined by the pediatrician at admission to the camp, and the supervisory staff noted variations in eating habits. Since levels of vitamin C in the blood are dependent upon the intake of the vitamin (2), the data and observations for each child constitute a means of evaluating his progress toward better nutritional status. For the group, the records of "nutritional conditioning" provide information of economic importance in that they indicate the relative values of the camp experience over periods of two to six weeks. The changes in nutritional status with respect to other blood components will be discussed in subsequent papers.

### RESULTS AND DISCUSSION

Malnutrition or nutritional inadequacy may result from a primary dietary deficiency, (failure to provide the right foods in ample amounts at proper times), from a conditioned deficiency attributable to factors which interfere with the ingestion, absorption, or utilization of essential nutriments, or from factors such as growth and destruction of nutriments in the body (3, 4), which produce increased requirements. The children chosen to attend the camp fell into the following medical categories: cardiac involvement; speech and hearing defects; orthopedic ailments principally residual from poliomyelitis, but including a few cases of spasticity and other debilitating conditions; and, general malnutrition or undernutrition common to underprivileged children. Many of the children were known to have existed for years in an environment that did not provide even the minimal amounts of nutriments needed to maintain their bodies in a satisfactory nutritional condition. With some, chronic misfeeding and underfeeding dated from birth, and their bodies had become conditioned to inadequate diets. Others had deficiencies secondary to physical and emotional handicaps which interfered with the ingestion, absorption, or utilization of essential nutriments.

For the ninety-nine children studied at Bay Cliff Health Camp, the medical examinations on admission showed each child to have some oral abnormality or infection, such as dental caries, excessive dental repair, gum hypertrophy, gingivitis, or malocclusion. Sixty-two showed, in addition, evidence of inferior nutritional status designated as: undernutrition, pallor, granulation of eyelids, smooth tongue, follic-

[1] Received for publication January 10, 1948.

[2] The term "vitamin C" has been applied to results obtained in this laboratory by methods which determine greater vitamin C activity than would be found by using methods which determine only ascorbic acid.

ular conjunctivitis, or rough, dry skin. At camp all of the children responded to the superior environment, excellent diet, and activities planned and directed to conform with the physical and mental limitations of the individuals.

The average weekly gains or losses in body weight are shown in Figure 1 for children of different ages in each medical group. Ninety-three of 99 children increased their body weights by 0.1 to 25.1 per cent during the six weeks, making average weekly gains

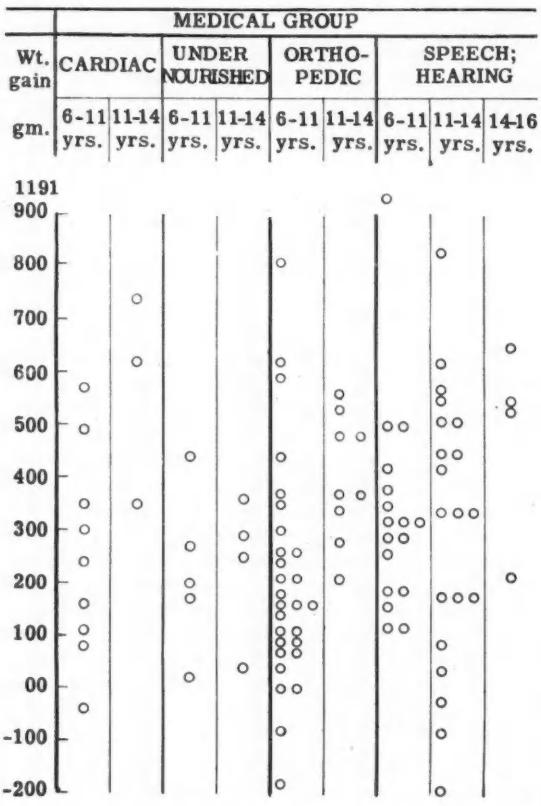


FIG. 1. *Average weekly weight gains of children during six weeks at Bay Cliff Health Camp, distributed according to age and medical groups.*

of 5 to 1191 gm. Fifty-two made greater gains during the first half of the period, 40 during the second half. Of those who showed a net gain, 5 children had weight losses during the first half of camp which were more than offset by gains during the final weeks, and for 8 children, weight gains in the first weeks were sufficient to offset losses during the second half of the camp period.

Increase in weight and height are generally considered criteria of growth and development in childhood and are determined by measurements that may be taken reasonably accurately and without trauma to the subjects. Yet healthy growth may take place in various sections of the body or throughout the body as a whole, even though undetectable with scales or measurements of height. Determinations of the amounts of nitrogen and minerals used to constitute new body tissues and maintain old tissues (5) have shown that neither weight gain nor failure to gain in body weight are conclusive evidence of good or poor nutritional status, for increments in body tissues may be forming without gain in total weight or height. Accompanying the growth of tissue, demonstrated by retentions of nitrogen and phosphorus for the formation of muscles, nerves, and glands, and calcium and phosphorus for formation of bones, unchanged or reduced weight may denote a change in fluid balance with resultant loss of water from tissue, or a loss of fat.

Weight gain is not as reliable a criterion of satisfactory growth conditions for the growth and development of children as is a thorough evaluation of nutritional status, for even with food intake sufficient to allay hunger and produce weight gain, the diet may not contain essential substances in amounts sufficient to maintain in the blood and body tissues the levels requisite to health, much less provide reserves for periods of stress. If the body has become conditioned to an inadequate diet, weeks may be required for nutritional conditioning, with the accompanying attainment of the physiological adjustment of body tissues and fluids necessary for nutritional stability and normal growth. Although a number of the children in the present study arrived at camp with supplies of commercial vitamin products, the data indicate that either they had not been taking the synthetic products for sufficient lengths of time or that the substitutes for proper food were not adequate. For the children studied at Bay Cliff Health Camp the results of determinations of vitamin C in their blood serum provide a notable illustration of the beneficial physiological effects of proper food and healthful environment, as well as of rapidity with which nutritional conditioning may be achieved and the nutritional stability that can be attained.

Figure 2 portrays the changes in fasting blood serum vitamin C levels for those children from whom samples were obtained two or more times while they were in camp. The initial levels show that the majority of the children (59 of 88) had less than 0.8 mg. of vitamin C per 100 cc. of blood serum 1; values for 27 were indicative of deficiency (0.0 to 0.5 mg. per 100 cc.); and values for 32 indicated a prescorbutic state (0.5 to 0.8 mg. per 100 cc.) (2). Only 21 had unquestionable levels, ranging from 1.0 to 2.3 mg. vitamin C per 100 cc. of serum, and only 29 had concentrations of vitamin C considered adequate to sustain health and provide a margin of safety for rapidly growing children (2). Since the blood samples for the initial determinations were obtained after the children had been in camp for several days

and the response to increased intakes of vitamin C is known to be extremely rapid, it is likely that many of the children had even lower levels of the vitamin in their blood serum prior to admission to the camp.

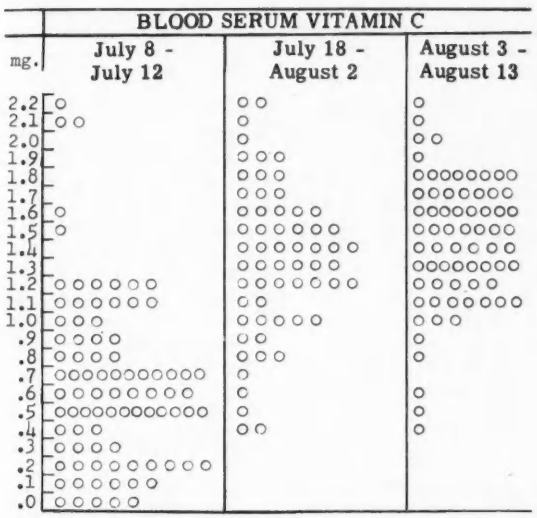


FIG. 2. *Fasting blood serum vitamin C levels of children during first week, in the third and fourth weeks, and after four weeks at Bay Cliff Health Camp.*

The vitamin C studies in the middle and final weeks of camp provided a striking example of progressive improvement and stabilization in the nutritional status of children in response to improved dietary and environment. After three to four weeks at camp (Fig. 2), determinations for 61 children showed none with a serum vitamin C value below 0.4 mg.; 51 with values of 1.0 mg. or more; and 10 below 1.0 mg., of which only 5 were below 0.8 mg. per 100 cc. Determinations during the final two weeks of camp showed 64 children to have levels of blood serum vitamin C at or above 1.0 mg. per 100 cc.; 2 with levels of 0.8 and 0.9 mg.; and 3 with 0.4 to 0.6 mg. per 100 cc. (Fig. 2).

For the six children who had net weight losses for the entire camp period (Fig. 1), Table 1 shows that two (Marian and Patsy) were noted to be obese upon examination by the pediatrician; but one other child (John) also was definitely below standards of height-for-age and above standards of weight-for-age. The nutritional status of five of the six children was assessed as "excellent" or "average." The weight losses of 80 to 198 gm. per week undoubtedly represent losses of adipose tissue greater than their increases in muscle and bone. The small average weight loss per week (19 gm.) of Claude for the entire six weeks and the larger loss by Edward (85 gm.)

TABLE 1

*Body weights and blood serum vitamin C values of children who lost weight during six weeks in health camp*

| SUBJECT | AGE | INITIAL BODY WEIGHT | GAIN IN BODY WEIGHT IN SIX WEEKS | AVERAGE WEEKLY WEIGHT CHANGE | | | BLOOD SERUM VITAMIN C | | | | PHYSICIAN'S NOTES AT ADMISSION EXAMINATION | COUNSELLORS' NOTES ON FOOD HABITS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Entire camp period | First half of camp period | Last half of camp period | July 8 to July 14 | July 22 to August 4 | August 5 to August 11 | August 12 to August 17 | | |
| | *yr.* | *kg.* | % | *gm.* | *gm.* | *gm.* | *mg./ 100 cc.* | *mg./ 100 cc.* | *mg./ 100 cc.* | *mg./ 100 cc.* | | |
| Clifford | 7 | 23.4 | −1.0 | −38 | +113 | −189 | 0.50 | | 0.92 | | Nutritional status average; slight pallor | Dislikes tomatoes, oranges, apricots, and prunes; not fond of salads |
| Patsy | 8 | 31.6 | −1.5 | −80 | −123 | −38 | 1.28 | | | 1.54 | Nutritional status excellent; slight hypertrophy of gums; slightly obese | Reducing diet; likes milk; dislikes asparagus and cottage cheese |
| Marion | 9 | 35.9 | −2.9 | −175 | −246 | −104 | 0.70 | | | 1.76 | Moderately obese | Reducing diet; good eating habits |
| John | 11 | 41.3 | −2.9 | −198 | −283 | −113 | 0.05 | 1.32 | 1.24 | 1.10 | Nutritional status average | Likes potatoes and gravy; dislikes cooked cereals, cheese, asparagus, peanuts, and bananas |
| Claude | 12 | 42.3 | −0.3 | −19 | −38 | 0 | 0.50 | 1.72 | 1.54 | 1.58 | Nutritional status excellent | Dislikes asparagus |
| Edward | 12 | 37.8 | −1.3 | −85 | −161 | −9 | 0.11 | 1.04 | 1.37 | 1.33 | Nutritional status average | Likes bread, potatoes, average amount of salads, and raw vegetables; dislikes milk and asparagus |

TABLE 2

*Body weight and blood serum vitamin C values of children in health camp for whom all values were below 1.0 mg. of vitamin C per 100 cc. of serum*

| SUBJECT | AGE | INITIAL BODY WEIGHT | GAIN IN BODY WEIGHT IN SIX WEEKS | AVERAGE WEEKLY WEIGHT CHANGE | | | BLOOD SERUM VITAMIN C | | | PHYSICIAN'S NOTES AT ADMISSION EXAMINATION | COUNSELLOR'S NOTES ON FOOD HABITS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Entire camp period | First half of camp period | Last half of camp period | July 8 to July 14 | July 22 to August 4 | August 5 to August 17 | | |
| | *yr.* | *kg.* | % | *gm.* | *gm.* | *gm.* | *mg./100 cc.* | *mg./100 cc.* | *mg./100 cc.* | | |
| Jeanne | 6 | 19.1 | 9.2 | 293 | 302 | 283 | | 0.60 | | Nutritional status average; slight pallor | Tempermental; excess milk, potatoes, and bread; few green vegetables and salads; dislikes cheese |
| Clifford* | 7 | 23.4 | −1.0 | −38 | 113 | −189 | 0.50 | | 0.92 | Nutritional status average; slight pallor | Dislikes tomatoes, oranges, apricots, and prunes; not fond of salads |
| Donald | 9 | 30.6 | 5.7 | 293 | 368 | 217 | 0.11 | 0.48 | 0.48 | | Excess milk, potatoes, and bread; eats a few green vegetables and salads; dislikes cheese |
| Vivian | 10 | 30.8 | 5.9 | 302 | 246 | 359 | 0.61 | | | Nutritional status good; granulation of eyelids; slight retraction of gums | Good food habits |
| Joan | 10 | 34.4 | 4.1 | 236 | 170 | 302 | 0.71 | 0.58 | | Nutritional status normal | Dislikes potatoes, ate a great deal of candy |
| Tom | 10 | 32.8 | 3.3 | 181 | 71 | 255 | 0.23 | 0.77 | 0.58 | Nutritional status average | Likes milk and potatoes; not much meat; no pork; eats a few green beans; dislikes asparagus |
| James C. | 10 | 21.8 | 8.3 | 302 | 491 | 113 | 0.60 | 0.42 | | Undernutrition I; slight granulation of eyelids | Small appetite; no bread; not fond of potatoes |
| Rita | 13 | 37.4 | 10.0 | 624 | 723 | 558 | 0.76† | 0.77 | | | Likes luncheon meats; dislikes hot meat and chicken |
| Joseph | 13 | 35.7 | 12.4 | 737 | 936 | 439 | 0.57 | | 0.66 | Nutritional status good; slight gingivitis | Eats everything |
| Adam | 13 | 26.7 | 11.0 | 491 | 359 | 624 | 0.05 | 0.83 | | Undernutrition II; slight folliculosis | Likes milk; excess bread and potatoes; fond of meat and fish |

* See also Table 1.

† Sample taken July 18.

TABLE 3

*Ranges and means of body weights and levels of blood serum vitamin C for 49 boys and 36 girls during six weeks in health camp**

| TIME OF TESTS OR FINDINGS | BOYS | | | GIRLS | | |
|---|---|---|---|---|---|---|
| | Minimum | Maximum | Mean | Minimum | Maximum | Mean |
| **Body weight** | | | | | | |
| At beginning of camp stay (kg.) | 16.4 | 73.4 | 30.9 | 19.4 | 55.0 | 32.0 |
| Gain first half of period (gm. per week) | −151 | 1465 | 392 | −312 | 945 | 301 |
| Gain in last half of camp stay (gm. per week) | −170 | 444 | 220 | −737 | 1106 | 243 |
| Total gain at end of camp stay (gm. per week) | 5 | 827 | 318 | 9 | 1191 | 311 |
| Gain during entire stay (%) | 0.1 | 12.2 | | 0.2 | 25.1 | |
| **Blood serum vitamin C** | | | | | | |
| | *mg./100 cc.* | *mg./100 cc.* | *mg./100 cc.* | *mg./100 cc.* | *mg./100 cc.* | *mg./100 cc.* |
| July 8 to 14 | 0 | 1.6 | 0.6 | 0.2 | 2.3 | 0.9 |
| July 15 to 28 | 0.6 | 2.0 | 1.4 | 1.4 | 2.3 | 1.7 |
| July 29 to August 4 | 0.7 | 2.2 | 1.4 | 1.0 | 2.2 | 1.4 |
| August 5 to 11 | 1.1 | 2.1 | 1.5 | 0.9 | 2.3 | 1.7 |
| August 12 to 17 | 1.1 | 2.2 | 1.6 | 1.3 | 2.0 | 1.7 |

* Data for 15 children given in Tables 1 and 2 are not included.

TABLE 4

*Body weights and blood serum vitamin C values of children in health camp for whom values were obtained above 2.0 mg. per 100 cc. of serum*

| SUBJECT | AGE | INITIAL BODY WEIGHT | GAIN IN BODY WEIGHT IN SIX WEEKS | AVERAGE WEEKLY WEIGHT CHANGE | | | BLOOD SERUM VITAMIN C | | | | | | PHYSICIAN'S NOTES AT ADMISSION EXAMINATION | COUNSELLOR'S NOTES ON FOOD HABITS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Entire camp period | First half of camp period | Last half of camp period | July 8 to July 14 | July 15 to July 21 | July 22 to July 28 | July 29 to August 4 | August 5 to August 11 | August 12 to August 17 | | |
| | *yr.* | *kg.* | % | *gm.* | *gm.* | *gm.* | *mg./100 cc.* | *mg./100 cc.* | *mg./100 cc.* | *mg./100 cc.* | *mg./100 cc.* | *mg./100 cc.* | | |
| Janice | 6 | 19.4 | 4.2 | 136 | 198 | 42 | 0.53 | 2.26 | | | | 1.85 | Nutritional status average | Eats almost all foods in large quantities; dislikes milk and cheese |
| Beverly | 7 | 24.9 | 1.9 | 80 | 76 | 85 | 0.56 | 1.45 | | | | 2.02 | Nutritional status average | Likes milk; average quantity of fruit; excess bread and potatoes; dislikes cheese; not fond of salads |
| Maxine | 7 | 27.5 | 2.4 | 109 | 28 | 189 | 0.54 | | | | 2.06 | | Undernutrition I; slight pallor of eyes; slight hypertrophy of gums | Likes bread, potatoes, and fruits; eats some cheese |
| Dayton | 8 | 25.5 | 0.9 | 38 | −94 | 170 | 0.74 | 2.00 | | 1.96 | | 1.89 | Undernutrition I; slight pallor | Excess milk; likes beets; likes potatoes moderately well |
| Marshall | 9 | 32.1 | 6.6 | 354 | 397 | 312 | | | | 1.68 | | 2.22 | Undernutrition I | An average appetite; excess milk; dislikes cottage cheese |
| James G. | 10 | 21.3 | 7.2 | 255 | 326 | 208 | 1.25 | | | 2.09 | | | | Slow eater; normally eats what is served |
| Ernest | 11 | 29.6 | 10.7 | 529 | 780 | 236 | 0.73 | | 1.52 | | 2.08 | 1.59 | Undernutrition II; moderate pallor; hypertrophy of gums; scaphocephalic head | Dislikes asparagus |
| Barbara | 11 | 38.7 | 7.0 | 449 | 321 | 576 | 2.26 | | | | 1.73 | | Nutritional status good; slight hypertrophy of gums | Normal appetite; excess bread |
| Allen | 11 | 32.0 | 8.7 | 463 | 680 | 246 | 0.55 | | 1.35 | 2.18 | 1.65 | | Slight undernutrition; gingivitis I | Good eating habits; dislikes asparagus |
| Helen | 12 | 30.5 | 7.0 | 357 | 340 | 383 | 2.15 | | | 2.21 | 2.13 | | Undernutrition II; slight pallor and hypertrophy of gums | Light eater; likes milk |
| Sally | 13 | 55.0 | 2.0 | 180 | 180 | 180 | 2.14 | | | | 1.88 | | Nutritional status good; mild gingivitis | Good eating habits; likes bread and potatoes; dislikes beets |
| Sonja | 13 | 36.5 | 0.7 | 45 | 567 | −737 | | | | | 2.28 | | Nutritional status good | Average eating habits; excess bread and potatoes |

occurred during the first half of the period, without significant gain or loss during the last half of the camp period. Clifford showed a gain during the first half of camp but lost a greater amount during the final weeks, perhaps owing to changes in fluid balance. The three overweight children showed weight losses of 123 to 283 gm. per week during the first half of camp and 38 to 113 gm. during the last half of the period, undoubtedly indicating losses of adipose tissue greater than the weight increases from growth of muscle tissue and bone. This belief is strengthened by the results of the vitamin C analyses, for although only one child (Patsy) had a satisfactory fasting blood serum level for the first sample taken, subsequent determinations for all children were above 0.9 mg. per 100 cc.

For all but ten of the children attending the camp (Table 2), values above 1.0 mg. of vitamin C per 100 cc. of fasting blood serum were obtained one or more times during the period. Only one sample was obtained from each of two children (Jeanne and Vivian). The only significant changes in serum vitamin C were the increases found for three boys (Donald, Tom, and Adam) whose blood levels were definitely scorbutic during the first week at camp, and for Clifford, who was one of the children showing an average weekly weight loss (Table 1). All of the determinations made during the fourth and fifth weeks were between 0.5 and 0.9 mg. per 100 cc., and if samples had been obtained from these children during the final week, greater amounts of the vitamin might have been found, for all of these children except Clifford increased their body weights by 3 to 12 per cent.

Range and mean values are given in Table 3 for the eighty-three boys and girls other than the fifteen for whom data are presented in Tables 1 and 2. The mean initial weights of the boys and girls were almost equal and the mean increments very similar, with the greater portions of the weight gains occurring during the first half of the camp period. Trends of the minimum, maximum, and mean values for serum vitamin C were alike for both boys and girls, all of which increased greatly for the determinations made one to two weeks after the first analyses. Thereafter, both sex groups evidenced very satisfactory levels of the vitamin in their blood serum.

Table 4 shows the data for twelve children whose fasting blood serum contained over 2.0 mg. of vitamin C per 100 cc. at some time during the camp period. Three (Barbara, Helen, and Sally) had levels above 2.1 mg. during the first week, although Helen was designated "undernutrition II" by the pediatrician, and all three showed hypertrophy of the gums, or gingivitis. Only one other child (James) showed a satisfactory level of serum vitamin C during the first week, 1.2 mg. per 100 cc. Of six children with 0.5 to 0.7 mg. of vitamin C per 100 cc. during the first week, two had over 2.0 mg. the following week but four did not attain this level until in the final three weeks of camp. The data are of special interest in that they demonstrate the readiness of children's bodies to achieve levels of serum vitamin C above 2 mg. per 100 cc. within a short time in response to proper environment and unsupplemented diets composed with common foods. Values above 2.3 mg. were not found, although blood samples obtained subsequent to those found to be high were analyzed for several children. In a study of the blood serum vitamin C of mothers and infants (6), the maximum level found in cord blood was 2.2 mg. per 100 cc. It seems likely that the maximum fasting level lies between 2.0 and 2.5 mg. of vitamin C per 100 cc. of blood serum.

All of the data are evidence of the wide variation which should be expected among children. In the group at camp, average body weight gains ranged from 5 to 1191 gm. per week, and during the six weeks individuals gained from 0.1 to 25.1 per cent of their inital body weights. The extremely rapid weight gains of the majority of the children and their improved nutritional status, as indicated by values for blood serum vitamin C, were made possible by the superior diets and environment provided at the camp. However, utilization of these necessities for nutritional conditioning was controlled by several physiologic factors, among which were variations in requirement owing to varying body demands for growth or for development by children of different ages, sizes, and degrees of maturity and to varying *capacities* for growth and development by children of the same age, size, or sex. Past experience is dominant among all the influences causing variation in children's *requirements* for nutriments and in their *ability* to use them. The data obtained at Bay Cliff Health Camp demonstrate the prior nutritional inadequacy of the attendees and the rapid initial response of the majority of children to improved diet and environment. The results, however, strengthen the belief that nutritional conditioning or reconditioning is in large part dependent upon the extent and duration of the previous dietary inadequacy (or malnutrition from other cause) and indicate that an even longer period of improved dietary and environment would have resulted in further nutritional conditioning.

SUMMARY

Determinations of body weight and fasting blood serum vitamin C and pediatric examinations provided data with which to assess the nutritional conditioning of fifty-seven boys and forty-two girls, six to fifteen years old, during six weeks in a health camp. Medical examinations on admission showed each child to have some oral abnormality or infection, such as dental caries, excessive dental repair, gum hypertrophy, gingivitis, or malocclusion; sixty-two showed evidence of inferior nutritional status

designated as: undernutrition; pallor; granulation of eyelids; smooth tongue; follicular conjunctivitis; and rough, dry skin.

Ninety-three of 99 children increased their body weights by 0.1 to 25.1 per cent during the six weeks, making average weekly gains of 5 to 1191 gm. The initial levels of fasting blood serum vitamin C showed that the majority of the children (59 of 88) had less than 0.8 mg. of vitamin C per 100 cc., values for 27 being within the scurvy level (0.0 to 0.5 mg. per 100 cc.), and values for 32 indicating a prescorbutic state (0.5 to 0.8 mg. per 100 cc.). After three to four weeks at camp, determinations for 61 children showed none with a serum vitamin C value below 0.4 mg.; 51 with values of 1.0 mg. or more; 5 from 0.8 to 1.0 mg.; and only 5 below 0.8 mg. per 100 cc. Determinations during the final two weeks of camp showed 64 children to have levels of blood serum vitamin C at or above 1.0 mg. per 100 cc.; 2 with levels of 0.8 and 0.9 mg.; and 3 with 0.4 to 0.6 mg. per 100 cc. The data are of special interest in that they demonstrate the readiness of children's bodies to achieve levels of serum vitamin C of 1.5 to 2.3 mg. per 100 cc. within a short time in response to proper environment and unsupplemented diets composed of common foods.

The data demonstrate the prior nutritional inadequacy of the subjects and the rapid initial response of the majority of children to improved diet and environment. The results strengthen the belief that nutritional conditioning or reconditioning is in large part dependent upon the extent and duration of the previous dietary inadequacy (or malnutrition from other cause) and indicate that an even longer period of improved dietary and environment would have resulted in further nutritional conditioning.

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### *Milk as an Agent in Preventing Dental Caries*

Milk with a high-fluorine content may play a part in preventing dental caries, according to Dr. George C. Supplee, Head of G. C. Supplee Research Corporation, who spoke at the September meeting of the American Chemical Society. He stated that there is evidence indicating that cattle fed on forage grown on soils with a high-fluorine content give milk with a slightly higher fluorine content than ordinary milk. It is believed that this may help in checking dental caries.

Another recently reported study was made at the Wisconsin Experiment Station by C. A. Elvehjem and associates. This investigation showed that sugar appears to cause little or no tooth decay when dissolved in milk. When animals were fed a ration similar to an ordinary human diet, containing 17 per cent sugar in dry form, many cavities developed. However, when this sugar was homogenized in liquid milk, the decay was slight. These investigators believe that the fine, dry particles of sugar may come in close contact with the teeth and lodge there longer, thus encouraging decay.—*From Food Field Reporter, October 13, and December 22, 1947.*

### *Carbohydrate Calories*

When free choice of foods is permitted, the appetites of experimental animals are generally responsive to nutritional need. Thus a complete protein is selected over one lacking in essential amino acid; a salt mixture containing calcium is selected by parathyroidectomized animals, and extremely small concentrations of sodium chloride can be detected by rats after adrenalectomy. While it has long been known that a drop in environmental temperature stimulates an increase in the consumption of energy-yielding food, a recent study by Donhoffer and Vonotzky has shown that the preferred source of calories changes when the temperature is altered; whereas at room temperature mice consumed a food rich in fat, at 10° to 14°C., not only was the energy intake greater but there was a shift to a diet rich in carbohydrate. Increase to 29° to 33°C. in the environmental temperature caused a drop in the total calories consumed and a shift away from the carbohydrate food. A similar preferential use of carbohydrate was shown after the administration of thyrotoxin. These observations support the well-known concept of the preference of carbohydrate in muscle activity which frequently is confused with the demand for fat because of the satiety value of the latter.—*From Current Comment, J.A.M.A. 135: 718 (November 15), 1947.*

# Guar Polysaccharide as a Precursor of Glycogen[1]

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FOR many years we have been concerned with the availability of naturally occurring polysaccharides and related substances as precursors of glycogen. Our attention was called to guar, a legume of the genus Cyamopsis, which is native to India, where the seed is employed as a food for man and animals. Recently the plant has been grown in the United States to obtain the endosperm for use as a sizing agent for paper and textiles and as a dispersing agent, stabilizer, and thickener in food products.

Wise and Appling (1) examined the ground endosperm and showed that it can be readily separated into a water-soluble (95 per cent) and water-insoluble fraction. The water-soluble and insoluble fractions on hydrolysis yield mainly mannose and galactose.

## EXPERIMENTAL

Young male rats of a uniform laboratory stock, weighing from 150 to 200 gm. were fed a balanced ration (Purina Chow) for three days. They were then fasted for 48 hr. and divided into the following experimental groups according to diet:

(a) Cacao butter controls
(b) Cacao butter plus 30 per cent guar flour
(c) Cacao butter plus 30 per cent wheat flour
(d) Cacao butter plus 30 per cent locust bean gum

Twelve to eighteen animals for each diet were divided into groups of three. Then the food was given *ad libitum*. The animals were fed their respective diets for two days. At the end of the feeding period the animals were anesthetized with intraperitoneal injections of amytal sodium and their livers extirpated. The glycogen was separated by the method of Good, Kramer, and Somogyi (2) and the dextrose obtained by the hydrolysis of the glycogen was determined by the Munson-Walker method. The results are shown in Table 1.

Monke (3) working in this laboratory showed that acacia fed under these experimental conditions to the white rat was unavailable as a precursor of glycogen in the liver. Acacia is employed in medicinal and sometimes in food products as an adhesive and emulsifying agent.

TABLE 1

*Glycogen storage in the liver of the rat after control and experimental diets**

| CACAO BUTTER | | GUAR FLOUR | | WHEAT FLOUR | | LOCUST BEAN GUM | |
|---|---|---|---|---|---|---|---|
| No. of rats | Liver glycogen | No. of rats | Liver glycogen | No. of rats | Liver glycogen | No. of rats | Liver glycogen |
| | % | | % | | % | | % |
| 3 | Less than 0.1% | 3 | 0.65 | 3 | 2.30 | 3 | 0.25 |
| 3 | | 3 | 0.65 | 3 | 2.60 | 3 | 0.92 |
| 3 | | 3 | 0.60 | 3 | 2.95 | 3 | 0.16 |
| 3 | | 3 | 1.09 | 3 | 2.85 | 3 | 1.16 |
| 3 | | 3 | 1.41 | 3 | 2.28 | | |
| | | 3 | 0.41 | | | | |
| Average | | | 0.80 | | 2.60 | | .62 |

* The quantity of food consumed by each group of experimental animals and control animals was approximately the same. All figures for glycogen obtained after moist livers were pooled.

## SUMMARY

The data in Table 1 show that the ground endosperm of guar seed is available as a precursor of glycogen in the liver of the white rat. The efficiency of guar in this capacity is much less than that of wheat flour but comparable to that of locust bean gum.

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[1] Supported in part by a grant from General Mills, Inc., Minneapolis, Minnesota. Received for publication July 10, 1947.

# Factors Affecting the Quality of Cakes Made with Oil[1]

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THE widespread shortage of fats and oils during recent years led to a consideration of the use of oil as a shortening in baked products. This problem was undertaken to determine whether the batter structure of cakes made with an oil could be altered, by methods of manipulation, to the type of batter structure which would produce cakes of good quality.

Research in the field of cake quality has led to the conclusion that an oil or a liquid fat used as the shortening ingredient in plain cakes usually produces a cake of poor quality (1–4). It has been observed that cakes mixed with oil or melted fat as the shortening have low viscosity batters (1). There has been some indication that batters of low viscosity frequently are an oil-in-water emulsion type (5, 6); conversely, high viscosity batters have been observed to be water-in-oil emulsions (5). Certain investigators (6–9) have reported modifications of mixing methods which can be used to improve the quality of plain cakes made with oil or lard.

## EXPERIMENTAL PROCEDURE

A standard plain cake formula, as given in Table 1, was used. The cakes were mixed with an electric mixer and 200 gm. of batter were baked in small loaf pans at 365°F. for 35 min. Batter and room temperatures were controlled within two degrees of 26°C.

Viscosity measurements were made on all cake batters with a MacMichael viscosimeter. A No. 30 wire was used, and the cup revolved 20½ times per minute. Batter was poured into the cup to the level of the 2-cc. mark. Emulsion type was observed by a drop dilution test, by dye dissolution, and by microscopic examination.

After baking the cakes, moisture absorption or "wettability" tests (10) were made. Indices of volume were obtained by using the planimeter and by recording the weight of cake samples of definite volume. The latter method made use of the cylinders cut for the moisture absorption test. The cakes were scored subjectively for texture, tenderness, thickness of cell walls, moistness, "velvetiness," and flavor.

A preliminary series of cakes was baked in order to select methods of mixing which would produce satisfactory and unsatisfactory cakes made with oil. Twelve mixing methods were selected, six producing good cakes, six producing poor cakes.

TABLE 1

*Formula for plain cake*

| INGREDIENTS | AMOUNT | |
|---|---|---|
| | Weight | Measure |
| | *gm.* | |
| Cake flour | 284 | 3 cups |
| Sugar | 300 | 1½ cups |
| Baking powder (SAS phosphate) | 8.4 | 2 tsp. |
| Salt | 4.7 | ¾ tsp. |
| Shortening* | 112 | ½ cup |
| Milk | 244 | 1 cup |
| Eggs | 96 | 2 |
| Vanilla | 5 | 1 tsp. |

* For most of the experiments, the shortening was refined soybean oil.

Early observations indicated that by reserving the egg and adding it, stiffly beaten, at the end of the mixing process, the quality of the cake was improved. For each of the six methods which were selected as producing satisfactory cakes, the whole egg had been thus reserved. Since one of the six methods which produced unsatisfactory cakes had the egg white added last, these cakes will be referred to as "cakes with egg yolk added early." The twelve mixing methods included, among others, the conventional (Method *12*), conventional sponge, (Method *1*), muffin (Method *8*), and dough batter (Method *10*) methods of mixing.

## RESULTS AND DISCUSSION

Table 2 presents the data for the first series of cakes using the twelve methods of mixing. Each

[1] Received for publication December 16, 1946.

figure represents the average measurements of three cakes. Certain definite indications were apparent. In each of the six methods where the egg was reserved, the total score was higher than for any of the methods of mixing in which the egg or egg yolk was added early. The range of total scores for cakes in which the egg was reserved was 68 to 89 (on the basis of 100 as a perfect score); for the cakes in which the egg or egg yolk was added early, it was 32 to 59.

The addition of sugar to the egg to make a sponge improved the quality of the cake. This was indicated by the fact that the methods in which part of the sugar was beaten into the egg produced the three highest-scoring cakes, both in total score and for each individual characteristic scored. These three methods—*3*, *9*, and *1*—also gave cakes with the highest moisture absorption, which was considered a good indication of high quality.

With one exception, the relative viscosity measurements of the cake batters in which the whole egg was added late were higher than for the cakes in which the egg or egg yolk was added early. The average relative viscosity of the six batters mixed with the egg added last was 160° M.; for the cake batters in which the egg yolk was added early, it was 95° M. A high positive correlation ($r = .80$) was found between the relative viscosity of the batter and cake score. Entrapped air in the batters in which the egg was added last may have been responsible for the higher relative viscosity of those batters.

There was greater moisture absorption for each of the cakes with the egg reserved than for any of the cakes with the egg yolk added early. That the test for moisture absorption was directly related to cake score is shown in Figure 1. This highly significant correlation had an $r$ value of .92. Also, the cakes with the egg reserved usually had greater volume.

In a problem of this nature, each step of the investigation was dependent on the results previously obtained. In the next step, two of the twelve methods of mixing were selected for further study in

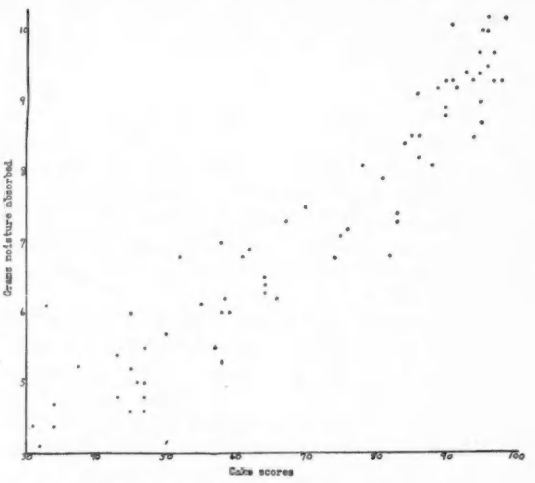


FIG. 1. *Scatter diagram showing relation of moisture absorption to cake score.*

TABLE 2

*Averages of data obtained by subjective and objective measurements of first series of cakes*

| METHOD | TOTAL SCORE* | GRAIN | CELL WALLS | TENDERNESS | MOISTNESS | VELVETI-NESS | FLAVOR | RELATIVE VISCOSITY | MOISTURE ABSORPTION | PLANIMETER INDEX |
|---|---|---|---|---|---|---|---|---|---|---|
| | *points* | *points* | *points* | *points* | *points* | *points* | *points* | *degrees M.* | *gm.* | *sq. in.* |
| Methods in which whole egg was reserved | | | | | | | | | | |
| 3 | 89 | 16.5 | 8.7 | 18.0 | 8.8 | 16.8 | 18.1 | 166 | 8.7 | 6.05 |
| 9 | 87 | 15.4 | 8.6 | 18.6 | 8.9 | 17.6 | 17.9 | 171 | 8.7 | 6.78 |
| 1 | 84 | 16.0 | 8.0 | 17.0 | 8.1 | 16.2 | 17.8 | 148 | 8.3 | 5.84 |
| 7 | 81 | 15.0 | 7.8 | 16.9 | 8.3 | 16.1 | 17.1 | 129 | 7.6 | 5.84 |
| 11 | 71 | 15.2 | 7.4 | 14.0 | 6.9 | 12.7 | 16.5 | 112 | 7.0 | 5.64 |
| 5 | 68 | 13.8 | 6.1 | 13.8 | 6.9 | 12.0 | 16.3 | 115 | 6.7 | 5.39 |
| Average | 80.0 | 15.3 | 7.8 | 16.6 | 7.9 | 15.2 | 17.8 | 160 | 7.8 | 5.92 |
| Methods in which egg yolk was added early | | | | | | | | | | |
| 6 | 59 | 10.0 | 4.9 | 11.6 | 6.3 | 11.0 | 15.2 | 91 | 6.6 | 5.57 |
| 4 | 58 | 10.4 | 5.3 | 11.9 | 6.1 | 9.9 | 15.4 | 148 | 6.0 | 5.86 |
| 8 | 55 | 9.6 | 4.4 | 11.1 | 6.0 | 9.9 | 14.2 | 74 | 5.9 | 5.26 |
| 10 | 47 | 10.1 | 3.6 | 7.8 | 4.8 | 7.3 | 13.1 | 68 | 5.0 | 4.72 |
| 2 | 45 | 7.3 | 3.0 | 8.5 | 5.0 | 7.1 | 12.9 | 90 | 4.8 | 5.34 |
| 12 | 32 | 5.3 | 1.9 | 5.6 | 4.0 | 4.5 | 10.9 | 102 | 4.3 | 5.09 |
| Average | 47.6 | 8.8 | 3.9 | 9.4 | 5.4 | 8.3 | 13.6 | 95 | 5.4 | 5.31 |

* Perfect score was 100.

an effort to determine more specifically the factors responsible for an improvement in cake quality when the stiffly beaten egg was added late. It was believed that varying certain mixing procedures in a good cake would make it a poor cake, and changes in the procedure for a poor cake would make it a good cake. One method, *3*, was selected because it produced the highest-ranking cake. The other method selected was the muffin method, *8*. While the muffin method did not produce the lowest-scoring cake, it made very poor cakes and was chosen because it might give a simple and practical method of mixing oil cakes, with some variations in procedure.

The variations of the better method were planned to determine whether it was the stability of the meringue or the time of adding the egg yolk, or both, which influenced the quality of the cake. The mixing procedure was changed to vary the time of adding the egg yolk and the time of adding the meringue. The egg was also added unbeaten early and late in the mixing process.

All of the modifications of the muffin method were made by using an egg and sugar sponge or egg white meringue, which was stirred into the batter as the last step of the mixing process. In each of the four variations, the egg yolk was added by a different method. Each of the variations scored much higher than the muffin method and even higher than the muffin method with the beaten egg added last.

The results of all the variations of these methods indicated that a stiff, stable sponge or meringue stirred in at the end of the mixing process was the most important factor in determining cake quality. Of the twenty-three mixing procedures used in the complete investigation, ten of the eleven methods of mixing in which an egg and sugar sponge or egg white meringue was added last produced higher scoring cakes than those mixed by any of the twelve other methods (Table 3).

TABLE 3

*The relation of methods of combining egg with cake batter to average score of cakes*

| METHOD NUMBER | TOTAL SCORE | EGG OR EGG WHITE MERINGUE ADDED LATE, STIFFLY BEATEN WITH ½ OF THE TOTAL SUGAR | EGG MERINGUE ADDED LATE, STIFFLY BEATEN WITH ½ OF THE TOTAL SUGAR | EGG ADDED LATE, STIFFLY BEATEN | EGG AND ALL OR PART OF SUGAR ADDED EARLY, STIFFLY BEATEN | EGG YOLK ADDED EARLY, EGG WHITE ADDED LATE, PARTLY BEATEN | EGG ADDED UNBEATEN |
|---|---|---|---|---|---|---|---|
| 8H | 97 | X | | | | | |
| 8E | 96 | X | | | | | |
| 8F | 96 | X | | | | | |
| 3E | 94 | X | | | | | |
| 8G | 93 | X | | | | | |
| 3Ba | 91 | X | | | | | |
| 3 | 89 | X | | | | | |
| 9 | 87 | X | | | | | |
| 1 | 84 | | X | | | | |
| 3Bb | 83 | X | | | | | |
| 7 | 81 | | | X | | | |
| 11 | 71 | | | X | | | |
| 3B | 70 | X | | | | | |
| 5 | 68 | | | X | | | |
| 6 | 59 | | | | X | | |
| 4 | 58 | | | | | X | |
| 8 | 55 | | | | | | X |
| 3A | 52 | | | | X | | |
| 10 | 47 | | | | | | X |
| 2 | 45 | | | | | | X |
| 3C | 42 | | | | | X | |
| 3D | 38 | | | | | | X |
| 12 | 32 | | | | | | X |

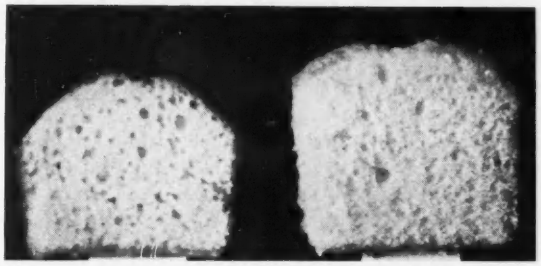

FIG. 2. *Representative slices of a poor and good cake.*

The time or method of adding the egg yolk did not consistently influence batter structure or cake quality. Judging from the fact that certain variations of the muffin method scored as high as or higher than any other method, the procedure for combining ingredients had little effect on cake quality, provided that a stiff egg-sugar sponge or egg white meringue was stirred in last. Other variations in technique, such as creaming the fat and sugar, or adding the flour and milk alternately, apparently made little difference.

Microscopic examination of the batters of the cakes made with soybean oil indicated that the emulsion type was oil-in-water, even in the batters which produced good cakes. In the batters of high-scoring cakes, the oil appeared to be in the form of many very small globules, and numerous very small gas bubbles were present. The batters of low-scoring cakes had more large oil globules and fewer gas bubbles. Dye dissolution tests also indicated that oil was not the continuous phase in any of the batters.

Certain characteristic differences were observed in the good and poor cakes (Fig. 2). The poor cakes had small volume, a definitely "humped" contour, and a glazed crust. The texture was coarse, with thick cell walls and occasional tunnels. The color of the cake was much darker than the cakes mixed with the egg or egg white reserved. These were the only cakes in which a definitely "oily" flavor was detected. There was a slight oiliness apparent in the texture.

The cakes in which the stiffly-beaten egg was added late had a slightly rounded contour similar to the best cakes, but were not as large as the cakes where the egg or egg white was stabilized with sugar. The texture was fine, though not as fine as the texture of the meringue cakes. The cakes usually were drier than those made with the meringue.

The highest-scoring cakes—those in which the egg or egg white was beaten stiff with part of the sugar and added late—had greater volume than any of the other cakes, perhaps due to the stabilizing effect of the sugar on the egg foam. They were fine-grained, velvety, and tender, with thin cell walls. In some cakes the texture showed occasional large holes, indicating that the very stiff meringue had not been thoroughly blended with the batter with the amount of mixing time allowed.

### PRACTICAL APPLICATION

The results of the experimental work on soybean oil cakes clearly indicated that highly successful cakes could be made by a simple adaptation of the muffin method of mixing. An obvious question which presented itself was: "Are the simple methods which produce successful soybean oil cakes satisfactory for use with other fats?" In an attempt to answer at least partially the question, butter, margarine, and hydrogenated fat as well as cottonseed oil, corn oil, and peanut oil were used in cakes. The butter, margarine, and hydrogenated fat were used in melted form (31° C.) and as plastic fats (26° C.). For these comparisons, a variation of the muffin method, called the muffin-meringue method, was selected as being easiest to use. The procedure was: make a stiff meringue with beaten egg whites and one fourth of the sugar; mix egg yolk, soft or liquid fat, milk, and vanilla; stir into sifted dry ingredients, mixing until smooth ($1\frac{1}{2}$ min. on low speed with electric mixer); blend the meringue with the batter. This method of mixing produced high-scoring cakes when oils and soft plastic fats (26° C.) were used. If the melted fats were at 31° C. when combined with the other ingedients the cakes were not as good.

The practical outcome of the study was the demonstration of improvement in the quality of oil cakes when a simple modification of the muffin method was used, and the suggestion that this muffin-meringue method is well adapted for use in cakes with soft plastic fats and oils.

### SUMMARY

The greatest improvement in the quality of cakes made with oil came from stirring in a sponge or meringue made of the stiffly beaten whole egg or egg white and one fourth of the sugar late in the mixing process. Combining the other ingredients by the muffin method, mixing until smooth, and then blending in an egg white-sugar meringue was a simple, practical method of mixing which produced high-scoring cakes. For ten of the eleven methods of mixing in which a sponge or meringue was used, the cakes scored higher than those mixed by any of the twelve other methods. The time or method of adding the egg yolk did not consistently influence batter structure or cake quality.

All the batters mixed with soybean oil, even those of high relative viscosity producing good quality cakes, were found to be of the oil-in-water emulsion structure. There was high correlation between relative viscosity of the batter and acceptability score and between moisture absorption and acceptability score.

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### *Flavored Honey*

In Corning, California, E. C. Close, a beekeeper, has succeeded in producing honey in six flavors—chocolate, maple, strawberry, lemon, pineapple, and mint. To produce the flavored honeys, the bees, which are kept in electrically heated glass hives with temperature controlled by a thermostat, are fed a "special mix" along with pollen and a sugar-water sirup. Each flavor is appropriately colored. To the strawberry, mint, lemon, and pineapple honeys are added artifical colors, but for the chocolate and maple flavors added coloring is unnecessary.—*Food Field Reporter, December 22, 1947.*

# Editorial

## RESIGNATION OF EDUCATIONAL DIRECTOR

The Executive Board of the American Dietetic Association announces that Lucille M. Refshauge, after four years as Educational Director for the Association, has resigned to accept the position of Director of Dietetics at Hartford Hospital, Hartford, Connecticut.

Miss Refshauge became Educational Director in June, 1944,* when the war was at its height and acceleration of approved dietetic internships was in effect. During those war years, she was instrumental in helping to bring about the peak enrollment of dietetic interns, namely 933 in 1944–45. She visited the internships already in progress and assisted with the organization of a number of new internships. Many "firsts" for the Association became realities during Miss Refshauge's appointment as Educational Director: approved administrative internships in industrial firms, hospital internships in Veterans Administration hospitals, in a U. S. Marine hospital, and in a large state hospital. The number of approved internships increased from 63 in 1942–43 to 71 in 1948. In addition to the scheduled visits to approved internships and those in the process of organization, Miss Refshauge developed a new service to dietetic departments—that of counseling. She gave unstintingly of her time and made every effort to provide expert guidance and assistance.

Miss Refshauge's keen analysis of situations and her ever-mindful attention to *quality* have resulted in many improvements in the educational program of the Association. In cooperation with the chairmen of Professional Education and the committees organized under that section, Miss Refshauge has contributed much to the preparation of the *Manual for Class Instruction for Dietetic Interns* and the *Manual for Teaching Nutrition and Dietetics to Student Nurses*. With the increased demands for dietitians during and following the war, Miss Refshauge has given generously of her time in helping to develop a vocational guidance program for the Association.

Last year, after representing the Association at the first national conference of UNESCO, Miss Refshauge and Anne Stewart Miller suggested the appointment of a Foreign Scholarship Committee as one of the first steps of the Association in developing an international relations program.

The members of the Executive Board, as well as Miss Refshauge's co-workers and associates, have all recognized her ability and leadership, and all who have worked with her have appreciated her delightful sense of humor.

Miss Refshauge's training and experience in the dietetic field have led her from her home in Nebraska, where she completed a bachelor's degree at the State University, to positions in the Middle West, the Southwest, and the East. After obtaining the Master of Science degree at Teachers College, Columbia University, she became Educational Director for the Association, in which capacity she travelled in every part of the country. She has now chosen a hospital position in her favorite New England setting. As an experienced administrator, Miss Refshauge is well-qualified to direct a department of dietetics in a large and progressive hospital. Her many friends in the dietetic profession, as well as those in allied groups, extend to her their best wishes in this new venture.

*See this JOURNAL for April, 1944, p. 231.

### A. D. A. LIAISON REPRESENTATIVE TO FOOD AND NUTRITION BOARD

Because of the wide areas of mutual interest, the American Dietetic Association has actively cooperated with the Food and Nutrition Board of the National Research Council in various activities for a number of years. Since last year, the Association has been well represented on the Food and Nutrition Board's panel of consultants through the participation of A. D. A. members in the work of the Board's Committee on Institutional Feeding. It is now a pleasure for the JOURNAL to be able to announce the appointment of Gladys E. Hall, Executive Secretary of the Association, as Liaison Representative to the Food and Nutrition Board. In this capacity, Miss Hall will automatically be invited to attend the meetings of the Food and Nutrition Board and will receive regular mailings of its proceedings, reports, and informative material.

Of the other organizations with which liaison is maintained by the Food and Nutrition Board, ten are official governmental or international organizations, such as the Veterans Administration, Children's Bureau, Quartermaster Food and Container Institute, and the Food and Agriculture Organization of the United Nations The officers and the Executive Board of the American Dietetic Association are particularly pleased that the Association, through the appointment of Miss Hall, has become the second professional organization to be so recognized. The other is the American Institute of Nutrition, whose Liaison Representative, Dr. Walter C. Russell, was appointed last year.

### CALCULATION OF DIABETIC DIETS

What degree of accuracy is needed in the calculation of diabetic diets where the objective is to avoid abnormal glycosuria and hyperglycemia and to provide nutrients in amounts sufficient for nutritive efficiency? In answering this question, controversial points arise both from a consideration of the wide variants in food composition and of the physiological use which is made of these foodstuffs in diabetes.

Newer research indicates that wide variations in food composition will occur not only as a result of varietal differences, variations in the conditions of growth and in the stage of maturity, but also with differences in food preparation and storage. A roast cooked to the same degree of "doneness" will vary 6 to 30 per cent in moisture content depending on the time and temperature used in cooking. Bread will vary widely in food composition depending on the storage conditions and the amount of drying that occurs. If the water used in the preparation of a vegetable is discarded, a further variation can be expected due to the loss of soluble carbohydrate and change in moisture content. And can you ignore the importance of available carbohydrates? In many cases there is a great discrepancy between total carbohydrate as calculated and available carbohydrate as used by the body.

What other factors affect the physiological use which will be made of the foodstuffs in diabetes? It is important to determine whether a high degree of accuracy is commensurate with the apparently spontaneous alterations in the severity of the diabetic state. How can approximations of carbohydrate, protein, and fat be appropriately reconciled with differences in the rate of utilization of these nutrients, the effects of exercise and emotions on the blood sugar levels, and the lack of a consistent relationship of insulin to glucose in different metabolic mixtures.

Since these considerations are so important, both to the dietitian and to the physician, the joint effort of the committees of the American Dietetic Association and the American Diabetes Association have been welcomed as a step forward.*

The A.D.A. Committee on Classification of Fruits and Vegetables met at the 1947 Annual Meeting of the American Dietetic Association to consider these and other important questions. Following these sessions, a proposal was made that a tentative classification be made available for trial use, and it is presented below. Dr. Eva Donelson Wilson, chairman of the committee, urges that comments be sent to the committee by all who give these figures a trial.

The following are the tentative proposals of the committee:

*Representative values of foods for use in diabetic dietary calculations*

| GROUP | AMOUNT | CARBOHYDRATE | PROTEIN | FAT |
|---|---|---|---|---|
| | | *gm.* | *gm.* | *gm.* |
| Milk | 1 pt. | 25 | 16 | 20 |
| Protein equivalents from List I | 1 egg, or 1 oz. meat, fish, fowl, or cheese | | 6 | 5 |
| Fruits from List II | 1 portion as listed | 15 | | |
| Vegetables | | | | |
| from List IIIa | as desired | | | |
| from List IIIb | ½ c. | 5 | 2 | |
| Carbohydrate equivalents from List IV | | 15 | 2 | |
| Fat equivalents from List V | | | | 4 |

It will be noticed that only two groupings of vegetables and fruits are considered, as far as the value of

*See this JOURNAL for September, 1947, p. 774.

carbohydrate is concerned. Fruits included in List II contain 15 gm. carbohydrate per serving. In List III will be found vegetables suggested for use, all of which have a carbohydrate value of 5 gm. or less per serving.

### LIST I

*Protein equivalents: 6 gm. protein, 5 gm. fat*

| FOOD | QUANTITY |
|---|---|
| Meat, fish, poultry | 1 oz. |
| Egg | 1 |
| Cheese, American | 1 oz. |
| Cheese, cottage | 2 Tbsp. |
| Oysters, clams, shrimp | 5 |
| Sardines, medium | 3 |
| Salmon, tuna, crab meat | ¼ c. |
| Peanut butter | 1½ Tbsp. |
| Cold cuts | 3 thin slices |
| Frankfurt, average size | 1 |

### LIST II

**Fruits—Fresh or Unsweetened Canned**

*Carbohydrate equivalents: negligible protein and fat, 15 gm. carbohydrate*

| FOOD | QUANTITY |
|---|---|
| Apple | 1 medium |
| Apricots | 3 medium |
| Banana | 1 small |
| Blackberries | ¾ c. |
| Blueberries | ½ c. |
| Cantaloupe | ⅓ medium |
| Cherries | ½ c. |
| Currants | ½ c. |
| Gooseberries | ¾ c. |
| Grape juice | ⅓ c. |
| Grapefruit | ½ large |
| Grapefruit juice | ¾ c. |
| Grapes | ½ c. |
| Huckleberries | ½ c. |
| Orange | 1 large |
| Orange juice | ¾ c. |
| Peach | 1½ medium |
| Pear | 1 medium |
| Pineapple | ¾ c. cubes |
| Plums or prunes | 3 small |
| Raspberries | ½ c. |
| Strawberries | ¾ c. |
| Tomato juice | 1½ c. |
| Watermelon | ⅛ slice, 1-in. thick |

### LIST III

**VEGETABLES**

a. *Negligible protein, fat and carbohydrate (eat as desired)*

Celery
Cucumbers
Escarole
Lettuce
Mushrooms
Parsley
Radishes
Watercress

b. *Carbohydrate equivalents: 2 gm. protein, negligible fat, 5 gm. carbohydrate (½ c. of any one)*

Asparagus
Beans, string
Beets
Broccoli
Brussels sprouts
Cabbage
Carrots
Cauliflower
Egg plant
Greens
beet, chard, mustard, kale, spinach, turnip
Onions
Squash
Tomatoes
Turnips

### LIST IV

*Carbohydrate equivalents: 2 gm. protein, negligible fat, 15 gm. carbohydrate*

| FOOD | QUANTITY |
|---|---|
| Beans, baked and Lima | ¼ c. |
| Bread, baker's | 1 slice |
| Corn | ½ c., or 1 small ear |
| Rice, macaroni, noodles | ½ c. |
| Graham crackers | 2 |
| Soda crackers | 5 |
| Peas | ½ c., scant |
| Potatoes, sweet | ½ small (size 5 to 1 lb.) |
| Potatoes, white | 1 small (size 5 to 1 lb.) |
| Cereals, cooked | ½ c. |
| Cereals, dry | 1 c. |

### LIST V

*Fat equivalents: negligible protein, 4 gm. fat, negligible carbohydrate*

| FOOD | QUANTITY |
|---|---|
| Butter or fortified margarine | 1 tsp. |
| Cream, light | 2 Tbsp. |
| Mayonnaise | 1 tsp. |
| Oil | 1 tsp. |
| Bacon | 1 long slice, crisp |

## *Detrimental Effects of Vitamin D*

A warning against overdoses of vitamin D preparations was sounded at the sixth annual meeting of the American Academy of Dermatology and Syphilology in Chicago in December. At this meeting Dr. C. H. Slocumb of the Mayo Clinics, Rochester, Minnesota, and Dr. Smith Freeman of Northwestern University School of Medicine presented an exhibit showing some of the injurious and even fatal consequences of vitamin D poisoning.

The physicians stated that no popularly used vitamin D preparation is safe from producing kidney damage, calcium deposits, and other toxic symptoms, and pointed out that dosages of from 50,000 to 100,000 units daily for as short a time as a week have caused injurious results. They emphasized the need for careful administration of vitamin D supplements under a physician's supervision and warned against self-medication with these preparations.—*Chicago Daily Tribune, December 10, 1947.*

# Current Comment

## REFRESHER COURSE FOR MEAT CUTTERS

VIOLET K. WALLFRED[1] and MARY C. FLETCHER[2]

Part of the Veterans Administration's "new look" is the four-week refresher course for meat cutters, the first of which was given last summer at the McGuire VA Hospital, Richmond, Virginia. Seventeen meat cutters from Veterans Administration's hospitals in the Richmond and Philadelphia Branch areas and two meat cutters from nearby U. S. Public Health Service hospitals attended.

On-the-job training and refresher courses for all VA food service employees are considered vital to good food service. They insure more palatable and better cooked food; a saving in food because shrinkage and waste are minimized; more uniform servings; and a notable decrease in the amount of fuel used for cooking purposes. In these courses food service personnel learn standards not only in the care and preparation of food but also in good housekeeping practices and personal hygiene.

Refresher courses for cooks and bakers have long been continuous projects of the dietetic service in the Veterans Administration. Courses for meat cutters, however, are of recent origin. They have now become regular projects conducted by the meat cutting specialist in Central Office and will be given eventually to all VA meat cutters throughout the country.

The outline of the course with instructions as to objective and implementation of the program was prepared by the Central Office staff in Washington. The course objectives are:

a. To provide additional training for meat cutters in VA hospitals.
b. To increase the efficiency of food service programs through the establishment of qualification requirements necessary for proper utilization of meat.
c. Through the boning method of processing meat to:
    1. Standardize handling and cutting procedures.
    2. Increase efficiency through elimination of lost motion.
    3. Process meat for cooking, carving, and serving in such manner as to obtain maximum utilization.

Following the outline of the course, the Branch Dietetic Office developed the weekly schedules of classes and assignments to cover the program as completely as possible based on available personnel and facilities. Every effort was made to cover all phases of the work adequately and to emphasize the particular duties of the group being trained. A dietitian on the staff of McGuire Hospital was on duty to assist in directing the group and to care for the attending details at McGuire. Fine cooperation was given by the VA Branch Office personnel training officer, who was responsible for the details of procurement and the showing of educational films.

Morning assignments, based on the regular menus at McGuire Hospital for the four-week period, were devoted to instructions and demonstrations in cutting and boning meat and on-the-job training in the prescribed methods. To cover all phases of the practical training, work was arranged in the following five main units:

(a) Receiving, storing, and issuing. All meat and meat products were inspected according to VA specifications, unwrapped, weighed, and properly stored.

(b) Meat processing. Instruction was given on kind, preparation, care, handling, and use of meat cutting tools and other equipment. Also, a supervised practice period in cutting and boning of meats was followed by a discussion of the best utilization according to cut and type.

(c) Fat rendering and storing. Fat trimmings were ground and rendered; put into pans for cooling; when cold, cut into 10-lb. blocks; wrapped in waxed and brown paper; dated; and stored in refrigerator.

(d) Meat and bone cookery. All trimmed bones were cut in 4-in. lengths and weighed; stock was prepared. Comparative tests on roast meats cooked at high and low temperatures were made by the meat cutters to show the advantages of low-temperature cooking, as well as the value of proper processing of meat.

(e) Carving and serving. Experience in proper carving for ward menus and cafeteria service was provided. During this time trainees maintained a check on the number of servings obtained from the amount estimated and prepared.

There were four trainees assigned to each main unit

[1] Chief, Dietetic Section, Veterans Administration Branch Office No. 4, Richmond, Virginia.
[2] Chief Dietitian, McGuire Veterans Administration Hospital, Richmond, Virginia.

(except one), rotating daily, thereby giving each trainee an assignment to each unit at least once a week. Daily charts were maintained by the individual trainee on fat rendering, meat cooking, meat comparison, meat cutting tests, and bone cookery. Results as shown on daily charts indicated their accomplishments.

It was felt that this program gave each trainee practical experience in the five phases mentioned and provided them with a better understanding of and appreciation for the cook's job and its relationship to that of the meat cutter. For example, the first time a meat cutter carved a baked ham and hit the knee cap which had been left in, he impressed on the others the difficulties encountered by overlooking this step in boning. Thus the actual completion of these operations proved the value of the correct boning methods employed as well as the need and importance of caring for equipment, refrigerators, proper inspection, and storage of meats. Real economy can be achieved by careful planning, including the processing of meat, cooking by the correct method at a low temperature thereby saving fuel and time and providing for an increased number of portions. The large amounts of fat saved were additional proof of the economy obtained through proper processing.

A classroom was provided for afternoon sessions which included lectures and films, review and discussion of the work, and completion of the charts and records kept by each trainee. Field trips to local markets and commercial plants were also conducted and proved interesting and instructive.

The classes included the following subjects:

(a) A thorough and comprehensive review of: the processing methods and use of beef, veal, pork, lamb, poultry, fish, and meat products; present VA specifications for packing house and dairy products; and maintenance of daily records of issues and inventories of meat.

(b) Safety and the operation and care of equipment.

(c) Sanitation and personal hygiene, covering bacteria, food poisons, communicable diseases, carriers of diseases, and so on. Ways to maintain sanitary conditions and the importance of personal hygiene were continually stressed.

(d) Nutrition, including discussions on normal nutrition, nutritive value of meats, planning menus, principles of meat cookery, preparing food in small quantities, and standardizing portions. These topics were covered by dietitians.

(e) Development of job breakdowns. Under the direction of the branch training officer each trainee was assigned to do a job breakdown pertaining to the meat cutting unit. In this way nineteen job breakdowns were developed by the group.

(f) Grading and inspection of meats, poultry and eggs, fish, and sea food. Representatives of the Division of Marketing Administration of the Department of Agriculture contributed much valuable information.

(g) The meat unit, including discussion on its arrangement; kind and amount of equipment and space required; spacing of track in the refrigerator; and amount of shelving needed This was followed by an assignment for each trainee in the planning of an ideal, efficient unit.

The films shown during the course were educational and added visual evidence and emphasis to related subjects, such as sanitation and personal hygiene and nutritive value and preparation of meat.

A written examination covering the important phases of the course was given at the end of the four weeks. Trainees were also graded daily on the care of their individual equipment and their general attitudes; on special assignments in meat processing, receiving, storing, and use; on fat rendering; and on cooking and carving tests. At the graduation exercises each trainee was presented with the "Certificate of Training."

The eagerness of the group to learn developed from the cooperation of all of the men. At first a few of the older trainees were hesitant or skeptical, but as the course progressed their interest was aroused and maintained at a high level. It was interesting to observe the mutual stimulation which pervaded the group.

The enthusiastic comments of the men on completion of the course and their desire to put their newly acquired knowledge into practice at their stations should indicate that profitable results will ensue.

## MEETING THE PERSONNEL SHORTAGE

JANETTE C. CARLSEN

*Ward Dietitian, The Johns Hopkins Hospital, Baltimore*

Before the war, curriculum in training schools for nurses and dietetic interns included a great deal of practical experience as well as formal classroom teaching. This was true at The Johns Hopkins Hospital. Student nurses were assigned for a given period to diet therapy service and were placed in complete charge of tray services for ward kitchens as part of their practical experience. Dietetic interns, during their assignment to ward service, were scheduled so that only a small amount of time was available for research and visits to patients.

During the war certain new educational trends developed. The curriculum was changed to meet these new practices, and student nurses now receive the required amount of nutrition and diet therapy in connection with their training in the entire care of the patient, rather than during a special assignment to diet therapy service. For example, when studying the care of the diabetic patient, the student nurse now learns not only nursing care, but is introduced to

dietary care as well. In cooperation with this program, dietetic interns now have conferences with student nurses in order to present the dietary care for the particular cases being studied. A change in the curriculum for dietetic interns, too, has been made so that they are now definitely scheduled to make visits to patients and are accompanied by an instructor.

In adopting such new practices, certain changes were necessary in the operation of the dietary department, for they meant that certain tasks that had been performed by student nurses and dietetic interns would have to be done by others. Since the dietary department is completely responsible for all tray service from ward kitchens and since part of the student nurses' training had previously placed them in charge of these kitchens, these changes in curricula presented a serious problem. The solution at the moment appeared to be the training of subsidiary personnel to take over some of the tasks that had formerly been done by the student nurses and dietetic interns.

It was decided to call these new subsidiary workers "dietitian's aides." The job description of the qualifications for this type of subsidiary help included the following points: twenty to fifty years of age (preferably twenty to thirty years); agile; adaptable; conscientious; able to work quickly; of medium height or taller; good eyesight. Previous experience, it seemed, was unnecessary and even undesirable, at least in the experimental stages of the program. A high school or vocational school graduate would be best suited for this type of work as the duties of the "dietitian's aides" would be routine and the prospects for advancement would be poor.

The outline of duties for dietitian's aides at first included the supervising and directing of tray service on public and private floors, serving deferred trays, pouring and serving nourishment, charting on special forms the fluid intake of patients, and weighing certain diets.

Later on, it became apparent that this type of subsidiary worker would be needed in the infant formula preparation unit because of the decrease in student nurses assigned to this service. As this unit is managed by the dietary department, dietitian's aides have been trained to do the complete preparation of formulas of all types.

Since the job specification called for little previous experience, people were employed who were not acquainted with life in a hospital. Thus, a planned training program seemed the only answer to this problem. A training manual was devised for the instructor as well as one for the dietitian's aide. The training manual for the instructor includes points to remember in training any new employee, i.e., know every detail of the job you are teaching; plan the instruction and prepare the subject matter in advance; start the new worker right by making her feel at home; present material to the learner in simple language; have the trainee try to apply what you have taught; have her shift gradually from learning about the job to doing it; and do follow-up training, at which economy in time and motion can be taught.

A seven-day training program was established. The first day includes a tour of the hospital and the dietary department with special emphasis on the main kitchen, dining rooms, the bakery, linen room, uniform room, locker room, various clinics, and the ward kitchens. This also provides an opportunity for observation of other aides at work. The second day the aide is taught to operate all equipment in the ward kitchen; learns the difference between public and private service; learns to interpret menus and diet slips; and is instructed in simple cookery and how to reheat different types of foods. The third day the aide repeats the experience of the second day and in addition learns to plan nourishment charts and do charting. The fourth day she is left more alone and is given the sole responsibility of the tray services. On the fifth, sixth, and seventh days the instructor is still with the dietitian's aide, but only in the position of a supervisor.

The manual for the dietitian's aide contains her own detailed work routine; her responsibilities; regulations as to uniforms, rules to be observed in the kitchen, and so on; diagrams of tray arrangements; charts for sample nourishment–1; instructions for writing charts; and copies of the routine house diets.

Unfortunately, it has not been possible to train all dietitian's aides at one time, for the decrease in student nurses assigned to diet therapy was gradual. This situation, however, made it possible to perfect our training program as more dietitian's aides were employed.

The advantages, however, far outweigh this one disadvantage. It has been possible with these subsidiary workers to:

(a) Have a stable group of workers for whom only one pre-induction period is needed. Student nurses changed every two weeks and many induction periods were previously required.

(b) Have less burden placed on the dietetic intern and provide more opportunities to develop supervisory capacities in the intern.

(c) Provide more uniform patient care since the dietitian's aide remains on the same floor.

(d) Provide better dietary care for the patient by reducing the routine tasks of the dietetic intern, thus allowing more time for visits to patients.

The training program for dietitian's aides has made it possible to employ subsidiary workers in the dietary department to do some of the tasks that had formerly been done by the student nurses and dietetic interns as part of their educational experience. Thus the problems created by a change of curriculum and a decreasing enrollment in the training schools for student nurses and dietetic interns were met.

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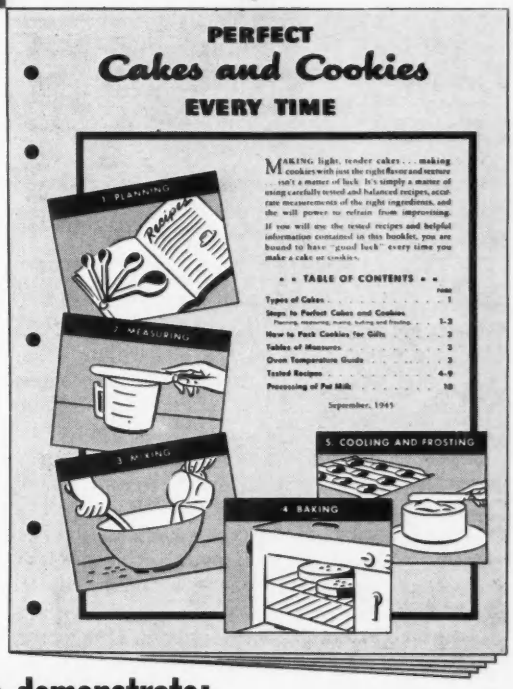


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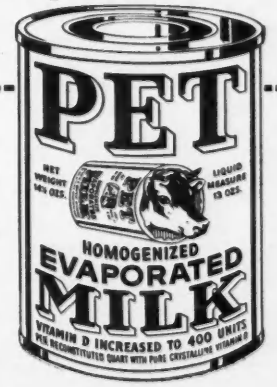


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## EVALUATION OF A TRAINING PROGRAM FOR HOSPITAL DIETARY EMPLOYEES[1]

MAGDALIN KLOBE ESPY

*Director of Dietetics, Saint Luke's Hospital, Cleveland*

There has always been some type of training for employees in hospitals, but in the past this was often a hit-and-miss proposition. Job procedures were usually passed on by one employee to another, many times in a very disorganized manner. The pressure of war years made it almost a "must" to organize training in such a manner as to get maximum efficiency from each person on the job whether her job was to sweep the floor or cook a three-course meal.

An organized training program was begun at Saint Luke's Hospital in October, 1945. Many questions arose in planning such a program. How were we to begin? Why did we want to train employees? Who would do the training? What should be the qualifications of the supervisor? Should we train each employee individually? What records were necessary?

It was decided to hire one person to do all of the training. She would be directly responsible to the director of dietetics. In our case we decided that the training supervisor should be a dietitian. We have often been asked, "Is it necessary to have a graduate dietitian as the person to take charge of training?" Naturally she is the best qualified for such work for she is acquainted with all jobs, procedures, and schedules necessary in the operation of a dietary department. However, an efficient lay person would undoubtedly be able to do a very good job in many cases. At Saint Luke's Hospital, our training is very closely correlated with the work of the dietetic interns, which we feel is another reason why it is to our advantage to have a dietitian as training supervisor.

There are also other qualifications to be considered in choosing a person for this position. She must like people and know how to handle them. She must be a leader with the ability to develop teamwork. She must have unlimited patience. She must have a good personality, and employees must have confidence in her.

We began this program by giving on-the-job training to each new employee, but now we have both individual and group training. As soon as an employee has been hired, she is turned over to the training supervisor. (I use the pronoun "she" because practically all employees in the dietary department are women.) The training supervisor explains to the employee where and when to get her uniforms, shows her where the locker room is, and demonstrates how to punch the time clock. Altogether the training supervisor spends about three days with each new employee; depending upon the job, however, it may require more time. During this three-day period, the employee is taught all steps of each performance required for her particular job.

After the initial training, the employee is turned over to the dietitian in charge of the unit. It is very important at this time to make it clear to the employee that she is, from then on, responsible to the unit dietitian and no longer to the training supervisor. These responsibilities should be indicated on the departmental organization chart.

At the end of the first week or ten days that an employee has been working, the training supervisor again spends a day with her doing a "follow-up," checking to see if she is following instructions and if she has a clear understanding of her duties. This is a good time to straighten out any difficulties.

In a program such as this, however, we cannot expect the employee training supervisor to be totally responsible. Every staff member must cooperate with the program and consider herself a teacher, for much teaching can be done in the course of everyday, routine supervision. How many times have you walked through your kitchen and seen people performing tasks with improper techniques? It is simple to stop for a few minutes to teach them the correct methods. Each time we teach, we should explain reasons and tell the employee why we do things and urge her to ask questions. It is surprising how well people follow instructions if they understand the purpose behind them.

In addition to individual instruction, group classes for either the entire personnel of the dietary department or for only the employees of small units of various divisions can be helpful too. An example of our small group classes is our daily 10-min. gathering of pantry maids. Each morning a floor dietitian checks over the menu with the maids and gives instructions for serving. Then about 5 min. are devoted to a short talk, demonstration, or discussion on a topic of interest. We have had many people participating in these classes. Sometimes we ask one of the maids to demonstrate certain procedures. It is encouraging to note the interest the girls have shown and the excellent suggestions they have made. An example of a week's classes would be as follows:

Monday: Safeguards to Observe on the Job (Dietitian)
Tuesday: Habits of Good Grooming (Employee)
Wednesday: How to Set up a Liquid Tray (Dietitian)
Thursday: Cleaning a Hot Plate (Dietetic Intern)
Friday: Employment Regulations (Personnel Director)
Saturday: Passing Nourishments (Dietitian)

Classes for the entire dietary group were begun last winter, and we are elaborating on them this year. Sanitation has been the main topic for the classes. The U. S. Public Health Service has an excellent series of 15-min. films which have been used. Some commerical companies also have good films on such subjects as dishwashing and coffee making. This

[1] Presented at the 30th Annual Meeting of the American Dietetic Association in Philadelphia, on October 15, 1947.

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Dietitian's Name.....

City.....State.....

year we are conducting follow-up classes for informal discussion after each film at which time employees are urged to participate.

In connection with group instruction, I should like to mention that the personnel department conducts a hospital tour each Tuesday for all new employees—professional and non-professional. We have found that our people take a great deal of interest in seeing the other departments and in realizing what part they play in the entire scheme of the hospital.

Several manuals have been compiled as teaching aids for our training program. We have prepared a pantry maid's manual which is given to each new pantry maid. An equipment manual is used in teaching the operation of each piece of equipment. It includes job breakdown sheets for all operations, both for the use and for the care of equipment.

Posters, too, are hung in the cafeteria and kitchen, but are changed frequently to maintain interest. We have been able to obtain some excellent ones, and dietetic interns also make effective posters.

In connection with this training program, a system for rating employees has also been developed. Written records, called progress reports, of the employee's progress in her work have been prepared. An employee is first rated after two weeks of employment. The rating is done, not by the training supervisor, but by the unit dietitian who goes over each report with the employee. After three months, just prior to the first salary increase, another report is made. If this is unsatisfactory, the raise is withheld with an explanation to the employee of the reasons, and another rating is made one month later. If the third report shows that an employee's work is still unsatisfactory, she may be either discharged or transferred depending upon the report. All three ratings are recorded on the same sheet with different colored pencils, one color for each rating. Thus a progressive evaluation of the employee's work is available on one form.

You may wonder whether the cost of such a training program is justified by the results. There is the salary of the supervisor, and there are other operating costs. We think that the cost *is* justified. We consider the expense as an investment and expect to profit by it in the future. We have been able to eliminate several jobs by dovetailing procedures. This fact alone proves that the cost of a training program probably pays for itself eventually. We also achieve greater production sooner from a new employee. The first few days on the job an employee is more or less unproductive. However, with planned training an employee is approximately 65 per cent productive after three or more days, and about 100 per cent productive in two weeks. Without planned training, at the end of one week the employee is about 50 per cent productive, and it takes about one month for her to become 100 per cent productive. The above figures, of course, are true only for what are generally referred to as service or subsidiary positions. In all probability, it would take a cook a longer time to acquire full productivity because of so many varying factors, such as adjusting to new types of recipes, adjusting to different types of stoves, and so on.

The results we are trying to obtain in our training program are many. First, we want each employee to be aware of the reason the hospital exists—to care for patients. Then we want to develop among our employees a pride in their work and an understanding of good service. This takes constant, persistent, and friendly supervision and training from day to day. It is a continuous job. We want also to reduce overall payroll costs and to obtain economical use of materials as well as of people. We want stable employees and fewer absences. We want to prevent accidents by the use of good techniques. We want to improve our working procedures and quality of work to the point where we make the best use of each employee's skills.

Our training program is now a little over two years old. In evaluating it, we feel that we are still in the beginning stages, and that there are many things to be done in the future, but we also feel satisfied with the results accomplished up to the present time. Although it is rather difficult to give comparative percentages because there are so many variables and intangibles involved, records show that our turnover has decreased. In exit interviews conducted by the personnel department when an employee leaves, we found that prior to the inauguration of our training program employees complained many times of having "too many bosses." This statement is almost never heard now.

Training does an important public relations job, too, not only for the hospital as a whole but also within our own department. Good human relations are essential in attaining employee happiness and satisfaction on the job. They also help in obtaining full cooperation from employees.

## TRAINING PROBLEMS IN AN INDUSTRIAL FOOD SERVICE[1]

MARY R. CURFMAN

*Chief, Restaurant Quality Control Inspection and Training Section, Restaurant Division, Western Electric Company, Hawthorne Works, Chicago*

There are four distinct factors which influence the acceptance of the dietitian in the field of industrial mass feeding:

(a) The prime interest of the industrial organization is in the manufacture of its products, not in its food service problems.

[1] Presented at the 30th Annual Meeting of the American Dietetic Association in Philadelphia, on October 15, 1947.

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(b) Because of established policy, the management of the feeding operation may have been placed under worthy manufacturing personnel, rather than people specially trained in food production.

(c) Industrial organizations sometimes attempt to dodge the feeding issue entirely by passing the responsibilities on to a concessionaire. Whether or not the concessionaire employs a dietitian is dependent upon the policy set up to govern the total salary expenses incurred by the firm.

(d) Industrial management needs more complete information regarding the qualifications of the experienced administrative dietitian.

A few points taken from an unpublished survey of industrial feeding operations, made in the fall of 1946, further illustrate the trend of industrial thinking. The twenty-one food organizations studied were conducting a volume of business in excess of a quarter of a million daily transactions. Seventeen of the group were company-operated and four were operated by concessionaires. In no case was the complete management under the direction of a dietitian, although four of the organizations employed dietitians to develop the standards essential to efficient organization and effective controls. The experience records of the managers varied greatly, but in sixteen of the operations they had developed their skills on the job through trial and error. In some cases the chef controlled the activities, including purchasing. The restaurant management of one company fully recognized the value of trained dietitians but was hampered by company policy in utilizing this knowledge.

Of the four organizations employing dietitians, one was a concession and the other three were under company management. In the latter, the dietitians carried greater responsibility and were granted more jurisdiction to execute their duties than in the former.

It is of interest to note the line of authority through which these food service managers functioned. In nine instances they reported directly to top management; in three, to the industrial relations director; in seven to the personnel manager; in one, to the chief accountant; and in one, a concession, the food service manager had to contact as necessary the works manager, the employee relations and medical departments, the plant superintendent, and the night superintendent.

No employee training program had been developed in any of these operations, and no personnel had been employed to conduct a specific training assignment. Only the three company-operated organizations employing administrative dietitians were working toward a training program which would incorporate group instruction, demonstrations, visual aids, on-the-job training, and follow-up. Five of the firms depended entirely upon older employees for the induction and training of new personnel; sixteen relied upon the combined efforts of supervisors and long-service employees, with the food service manager assuming responsibility for some follow-up in four cases.

Thus, we glimpse a brief picture of conditions which seem to characterize the average industrial food service. Let us apply some of these factors to the case at hand.

The Hawthorne Works of the Western Electric Company has owned and operated its own in-plant feeding for a period exceeding thirty years. Recently, the food service has grown into a business having an average daily customer count of 50,000. This figure represents approximately 22,000 hot meals, while the remainder covers snacks taken during rest periods. Preparation and service units include four kitchens, a central bakery, twelve cafeterias, one service restaurant, and two milk stations. Two of the kitchens and the central bakery are in operation 24 hr. daily; twelve of the service locations are open for two shifts, and seven of these operate around the clock. Consequently, from the standpoint of management, there are some forty-four units requiring direct supervision, in addition to the key personnel essential to purchasing, accounting, and various managerial and coordinating assignments. Actually, there are about four hundred hourly-rated and clerical employees, some thirty-two supervisors, and four dietitians in this restaurant organization.

Western Electric Company is justly proud of a comparatively low percentage of labor turnover, achieved through a well-established employee relations policy which includes a pension plan, various benefit plans, and numerous employee services and recreational activities. Some of the restaurant personnel have been with the company for as long as thirty years, although assignments have not necessarily been restricted to food service. Many have come up through the ranks into their present supervisory positions and now hold an enviable record of loyalty, continued interest, and ability to promote customer satisfaction and goodwill.

As they immediately concern the restaurant organization, the past three years have seen some departure from the established policy of promotion from within and rotation from other plant organizations. Progressive management realized the need for introducing specially trained personnel into the food service operation and, acting upon this premise, placed the complete restaurant organization under the leadership of a man experienced both in commercial restaurant work and in mass feeding. Under his sponsorship a "Restaurant Quality Control, Inspection, and Training Section" was created in 1946.

The four dietitians in this unit will ultimately fulfill the assignments of menu planning; development of purchasing specifications; development of standardized recipes; formulation of standards of service, housekeeping, and sanitation; special research proj-

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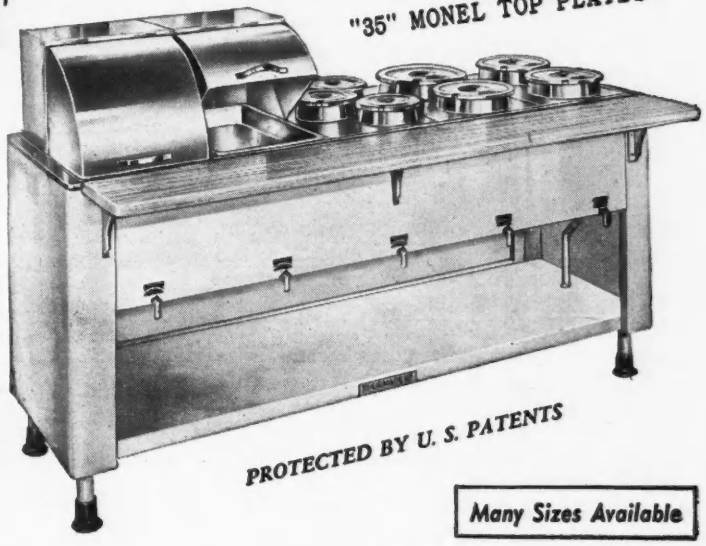

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ects; inspection; training of supervisory, skilled, and hourly-rated employees; and the many related functions which automatically tie in with these duties. In view of the size of the feeding operation and the number of personnel involved, it has, of course, been impossible to undertake simultaneously these various projects in their entirety.

The obvious beginning was the development of a training program which would precede, or at least parallel, the establishment of standards which will govern practices in the various preparation and service areas. It will also provide a guide to be used in the compilation of inspection check sheets. To date, class room instruction has been limited to the supervisory personnel, and the material presented has emphasized the principles of housekeeping and sanitation. Lectures and group discussions have been supplemented with film strips, movies, and the exposure of sterile agar plates to the types of contamination common to food service areas. Food handling practices have been given further emphasis through the direct application of city, state, and federal recommendations on sanitation. Three hours of class time were also devoted to discussion of mutual supervisory problems, since the physical layout of the plant and the distances between many locations prevent frequent contacts between food service supervisors.

Future supervisory classes will incorporate, through Job Instruction Training[2] demonstration, such procedures as the preparation, operation, and cleaning of the coffee urn, the meat slicer, the steam table, the dishwashing machine, and similar pieces of equipment. Since considerable emphasis is being placed on the elimination of direct hand contact with food materials, additional demonstrations will also include a standard procedure for sandwich preparation and the individual service of butter, pie, cake, rolls, doughnuts, and similar counter items.

Paralleling the class instruction, we have accomplished some on-the-job training in food handling and dishwashing procedures. This has been done especially in the cafeterias having new equipment installations and in the cafeterias having equipment with which a new or transferred supervisor was unfamiliar.

Since it is impossible for four dietitians to conduct an adequate 24-hr. training and follow-up program which will effectively reach over 400 employees in forty-four scattered operations, it has been emphasized that each individual supervisor is responsible for daily, on-the-job instruction. To assist in fulfilling this undertaking, the Restaurant Quality Control, Inspection and Training Section is preparing a manual which will incorporate the material previously discussed in the supervisory classes and demonstrations. A copy of this manual will be given to each supervisor who will then, under the guidance of a dietitian, conduct group meetings with the employees in the location. The dietitian will remain with the supervisor for the length of time needed to cover these group presentations and to direct follow-up on the job. Although this procedure will require considerable time to show overall results in all locations and on all shifts, so far it is the best answer we have found in our search for the wisest approach to our specific training problems.

Direct follow-up will be accomplished by the dietitians through inspection assignments. Check sheets now being developed will be used to evaluate the effectiveness of training, in addition to the overall operational details in each location on each shift, including the quality of supervision. Each supervisor will, of course, be provided with a copy of the check list, since complete familiarity with the points to be scored is essential. During inspection periods, the dietitians will also have added opportunity to assist the supervisor with on-the-job training of new or transferred employees.

A second manual, on cafeteria service standards, will provide an additional tool to be used in the development of the training and inspection procedures and will equip the supervisors with a concrete guide on established food handling practices.

This description of our approach to training problems would be incomplete without mention of the other organizations within the plant which play an important role in the growth of the project. The engineering organization assigned to kitchen and cafeteria layouts provides the restaurant training section with equipment terminology consistent with industrial usage. The Plant Maintenance and Service Organizations have available repair data for use in establishing a preventive rather than a curative program for prolonging the life and usefulness of food service equipment. The Works Training Organization, which for years has functioned effectively in the shops, has acquired a rich background of experience in training techniques and procedures. In addition to giving guidance and material assistance in planning and presenting our classes, the Works Training Organization encourages and welcomes the participation of restaurant supervisors in its courses which elaborate upon fundamental principles directly applicable to any type of supervisory responsibility. Newly employed dietitians are routinely enrolled in such classes as "Company Organization and Practices," "Basic Supervision," "Job Instruction Training," "Supervision of Job Training," "Job Methods Training," and "Motion Economy."

Our training progress to date can be briefly summarized as follows:

(a) Ten and one half hr. of lectures and group discussions which have emphasized good housekeeping, sanitary food handling, and mutual supervisory problems.

[2] As developed by the Training Within Industry Division, War Manpower Commission.

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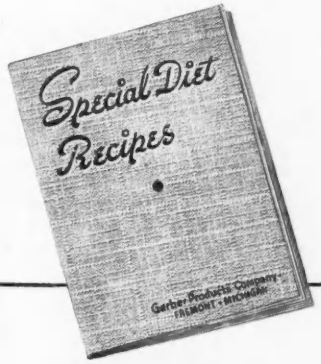


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(b) Some on-the-job training in food handling and dishwashing procedures.

(c) The development of demonstrations to incorporate Job Instruction Training; the use, care, and maintenance of equipment; orderly work habits; and standard procedures for counter preparation and service, stressing sanitation and motion economy.

(d) Initial preparation of a manual to serve as a guide to supervisors in group and on-the-job training of employees.

(e) A program of follow-up and inspection to aid the dietitians in giving direct guidance to the supervisor and employees in each preparation and service location.

(f) The preliminary preparation of a manual on cafeteria service standards.

(g) Full utilization of the services and information available from other organizations within the company.

And so we approach the training problems peculiar to our restaurant organization. Their solution requires patience, courage, tenacity and, above all, a personality which wins the cooperation and esteem not only of the food service supervisors and employees but the entire plant personnel as well. Their solution requires an approach which allows existing untrained supervisory personnel to retain the self-confidence and respect which they have justifiably earned on the job over a period of years. On the part of the dietitians our approach requires full comprehension of the contributions each long-service supervisor can make toward providing a greater appreciation of company practices and policies.

Even the comparatively small beginning which has been made is paying dividends and, as the program develops, we are confident that through continued cooperation, understanding, and perseverance we will attain our ultimate goals—namely, the service of the most wholesome food at the lowest possible cost to our plant personnel, and the fulfillment of our responsibility, as a plant personnel service, in the building of effective employee-management relations within the Western Electric Company.

### *New Appointments, Veterans Administration*

The following hospital appointments of dietitians (not previously announced) have been made by the Veterans Administration:

| Name | Position | Location |
|---|---|---|
| | *Branch No. 1* | |
| Doris Fraser | Staff Dietitian | Framingham, Mass. |
| Virginia Williams | Staff Dietitian | Framingham, Mass. |
| | *Branch No. 10* | |
| Alice B. Jensen | Staff Dietitian | Jackson, Miss. |
| Velma Lanier | Staff Dietitian | McKinney, Texas |
| | *Branch No. 12* | |
| Gwendolyn Castle | Staff Dietitian | Los Angeles, Calif. |
| Adelene Dorward | Staff Dietitian | Tucson, Ariz. |
| Virginia R. Gertmanian | Staff Dietitian | Van Nuys, Calif. |
| Kathryn Tondreau | Staff Dietitian | Oakland, Calif. |

### *Army Announcements Concerning Personnel*

The following Medical Dietitians were promoted during the month of December, 1947:

*First Lieutenant to Captain*
Carloss, Elizabeth S., R-230
Gill, Mary L., R-5
Horr, Frances M., R-828
Knox, Alice T. A., R-405
Ness, Alene V., R-339
Riley, Winifred G., R-1212
Strain, Ruth G., R-2088

The War Department has released the following official list of names of Medical Department Dietitians (not previously announced) who have been separated from service:

*First Lieutenant*
Covalt, Dorothea O., R-1401, E. Mountain Rd., Westfield, Mass.
Lent, Jane E., R-2477, Rt. 1, Towanda, Pa.

The following Medical Department Dietitians, who were previously reported separated, have been recalled to active duty:

1st Lt. Charlotte P. Claybrooke, R-107
1st Lt. Alice C. Hanratty, R-901

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Club 21 ..... New York City
Colonnade Cafeteria Chain ..... Principal Cities
Constantine's ..... Mobile, Alabama
Drury's English Inn ..... Montreal, Canada
Francis Virginia Tea Room ..... Atlanta, Georgia
Fred Harvey's Restaurant Chain ..... Principal Cities
Gallaghers ..... New York City
Green Gables ..... Phoenix, Arizona
Gustine's Restaurant ..... Cambridge, Massachusetts
Harding's ..... Chicago, Illinois
Hood's Restaurant ..... Greensboro, North Carolina
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# Book Reviews

**Food in Health and Disease.** By Katherine Mitchell and Genevieve Gormican North. 4th ed. Philadelphia: F. A. Davis Company, 1947. Cloth. Pp. 616. Price $3.50.

This fourth edition of a standard text book for student nurses' courses in nutrition, cookery, and diet and disease has been revised to bring it up to date with the newer information in nutrition and medicine. Genevieve Gormican North has acted as co-author of this edition.

Much of the section on diet therapy has been entirely rewritten, and additional emphasis has been placed on community nutrition. The general form and outline of the third edition have been retained, and it is well illustrated and maintains its easy style of reading.

The references should be given in the accepted form—with volume and page number, or publisher, edition, and so on—so that they would be more usable to the instructor and student alike. The questions at the end of each chapter could be revised and some made into the form of problems, projects, or situation questions. Questions at the end of the lessons in cookery would also be helpful additions both for the student and instructor.

This book will continue to be one of the better texts for use by dietitians in instructing student nurses.—*Doris Johnson, Teaching Dietitian, Presbyterian Hospital, New York City.*

**Diabetes Mellitus in General Practice.** By A. R. Colwell, M.D. Chicago: Year Book Publishers, 1947. Cloth. Pp. 350. Price $5.25.

This new book for the general practitioner includes a description of the characteristics of diabetes, the diagnosis, treatment by diet, insulin and its modifications, and the acute and chronic complications of the disease.

The author's concept of the successful management of diabetes demands that a diet be continuously constant in sugar value, be capable of maintaining normal weight and growth, be sufficient in essential food elements, and be of such a nature as to avoid abnormal glycosuria and hyperglycemia.

To accomplish this, he recommends a rigid dietary control in connection with the medical therapy—going so far as to prefer only the weighed diet. The only exceptions are those patients "who are illiterate, foreign, or who have poor vision [and] may be unable to use a weighed diet. In such cases, household measures and estimation by eye may be used."

One wonders whether the confidence placed in the accuracy to be gained from weighing the food on a gram scale in preference to estimates made from food purchases and from household measures is compatible with the newer knowledge concerning the wide ranges in nutrient content which have been found to result from varietal differences, differences in maturity, availability of the carbohydrate, and various methods of food preparation and storage.

In view of these variables, it is questionable whether weighing foods which have been calculated to give a precise level of carbohydrate, protein, and fat will insure reaching this point any better than, if as well as, estimation from food purchases and from household measures. Actually, estimates of edible portions of a number of foods, such as bread, butter or margarine, edible portions of meat or fish, milk, and eggs, may be derived from the food purchases. This would mean that the greatest variation in a weighed vs. an estimated diet would occur in vegetables and fruits, and in meat containing a high proportion of bone and fat. Unfortunately, the weighing of 100 gm. of food will not necessarily insure a particular carbohydrate content. In the case of vegetables, for example, in addition to varietal differences and differences in maturity and availability of the carbohydrate, the various methods of food preparation will have a marked effect. If the water used in food preparation is discarded, a significant loss can be expected in the soluble carbohydrate. Differences in food preparation will also affect the moisture content and thereby alter the percentage of carbohydrate, protein, or fat. For example, a roast may lose 6 to 30 per cent in weight, depending on the time and temperature used in cooking. Storage will also affect the moisture content of foods. For instance, it is conceivable that greater accuracy in calculating carbohydrate content might be reached by figuring one of sixteen slices in a pound loaf of bread as 30 gm. than would be reached by having a patient weigh 30 gm. of bread on a scale without consideration of the moisture loss that may have occurred from variable storage conditions.

It is also questionable whether the increase in accuracy hoped for in a weighed vs. a measured or estimated diet is commensurate with the apparently spontaneous alterations in the severity of the diabetic state. Other variables arise from the differences in the rate of utilization of various carbohydrates, protein, and fat, the effects of exercise and emotions on the blood sugar levels, and the lack of a consistent relationship of insulin to glucose in different metabolic mixtures.

In planning the level of calories, carbohydrate, protein, and fat to prescribe, the author recommends that calories be allotted for a maintenance diet in amounts sufficient to maintain a normal body weight and to permit growth. The allowance of protein may be determined on the basis of 1 gm. per kilogram of body weight for adults and twice or more of this amount for children. The levels of carbohydrate and fat can be determined by selecting a "proper ratio." It is suggested that a ratio be avoided which will approach a normal diet on the one hand and, at the other extreme, one that will produce a ketosis. A formula is given for obtaining several different ratios, and the mathematical procedures for carrying out the formula are explained in detail. This procedure would seem to be somewhat misleading in that greater scientific accuracy is implied than is actually obtained in view of the arbitrary nature of the selection of a ratio. It would seem that the selection of a level of carbohydrate and fat could be greatly simplified, and that greater emphasis of the principles might also be given to this matter by considering the levels necessary to meet the needs of the individual patient in terms of

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his nutritional requirements, his economic and social needs, and the palatability and acceptability of foods.

To help the practitioner with menu planning, a plan for the daily food intake is illustrated which is based on "eight standard foods." Appropriate amounts of these foods are recommended to correspond with the various dietary prescriptions. Tables of substitutions of common foods have been arranged to facilitate the use of proportional amounts. In addition, a special list of substitutions of packaged and prepared foods has been compiled. It contains such suggestions as: canned soups for vegetables; root beer and Coca Cola for fruit; and ice cream, doughnuts, gingerbread, plum pudding, cranberry sauce, angel food cake, and sponge cake for bread. In view of the need for diabetics to fit into family and social groups, this list will be particularly welcome. On the other hand, the content of such prepared foods will vary widely and their use will result in quantitative variation in carbohydrate, protein, and fat—a variation that would seem to be inconsistent with the degree of accuracy aimed at in the weighed diet.

Another recommendation of questionable value concerns the use of special diabetic foods, such as gluten bread, and mineral oil with foods. In view of the findings reported by the Council on Foods and Nutrition of the American Medical Association, a serious loss of fat-soluble vitamins from the diet may be expected when even small amounts of mineral oil are mixed with food.

While there is undoubtedly much of value in the book for the practitioner, it is to be regretted that the dietary recommendations were not handled with greater simplification and flexibility.

**Two Blades of Grass.** By T. Swann Harding. Norman, Okla.: University of Oklahoma Press, 1947. Cloth. Pp. 352. Price $3.50.

Subtitled "A History of Scientific Development in the U. S. Department of Agriculture," this book is an account of the research and services performed by this department of the government. It begins with the first activities of an agricultural nature which were carried out under government auspices by Henry L. Ellsworth, Commissioner of Patents, in 1836, describes conditions which led up to the formal organization of the Department of Agriculture in 1889, and carries through to the research developments of the present day. The author, who is a contributor to this JOURNAL, is an employee of the Department of Agriculture of some thirty years standing, and as such has had access to much documentary and historical data from which he prepared this book.

Each chapter deals with the work of a different Bureau or Service of the Department. The development of government-subsidized research in agricultural chemistry, insecticides, farmer-service, and the work of the plant and tree scientists and soil conservationists are just some of the topics covered. All through the book the author makes a point of bringing out of anonymity the workers who have made contributions to scientific knowledge and progress while working for the government as public servants.

The chapter titled "Food and Raiment" which describes the work and activity of the Bureau of Human Nutrition and Home Economics gives a historical approach to the development of this government service whose sole interest is to benefit the consumer. This chapter will, of course, be the most interesting to home economists. Special attention is given to the late Dr. W. O. Atwater, whose work in nutrition as first head of the Office of Experiment Stations antedated the founding of the Bureau of Home Economics in 1923 and its expansion to the Bureau of Human Nutrition and Home Economics in 1943. The contributions which Hazel K. Stiebeling has made in rendering theoretical dietary standards useful in practice are highlighted in this chapter, as is the invention of the calorimeter and the Bureau's studies in meat cookery and investigations of food composition.

The historical data and information presented in this book are interesting both in content and presentation. For those persons concerned with the historical approach or who wish background material for use in speeches or class work, *Two Blades of Grass* should prove a boon.

**Historic Cookery.** By Fabiola C. deBaca Gilbert. State College, New Mexico: Agricultural Extension Service, New Mexico College of Agriculture and Mechanic Arts, 1946. Paper. Pp. 46. Free.

The author, who is County Extension Agent in Santa Fe, presents this booklet of recipes with the hope that they will help the public become acquainted with New Mexican dishes. She describes them as "a product of the past and present—an amalgamation of Indian, Spanish, Mexican, and American." The names of the typical New Mexican dishes are given in both Spanish and English, and menus for luncheon and dinner suggest desirable combinations of these recipes. The measurements and methods of preparation are clearly and simply given and easy to follow.

For those unaccustomed to seasoning with red chile pods or powder, it may be desirable to reduce the quantity used the first time a recipe is made. However, an appreciation of the flavor of this condiment develops rapidly, and the cook will soon find herself using the full amount called for in the recipes. This booklet offers recipes which should be particularly stimulating for those dietitians interested in regional food habits as well as those whose hobby is entertaining by serving little known, indigenous dishes of this and other countries.—*Dorothy B. Hacker, Nutrition Consultant, New Mexico State Department of Health, Santa Fe.*

**Change in Price.** Announcement received from Pocket Books, Inc., states that the price of *The Pocket Book of Baby and Child Care* by Benjamin Spock, M.D., which was listed in the December issue of the JOURNAL, has been increased from 25 to 35 cents. It is available wherever pocket-size books are on sale.

### *Food Consumption in the U. S.*

E. A. Meyer, Administrator of the Research and Marketing Act of 1946, recently gave the following figures on American Food consumption, as compared with prewar.

| FOOD | PRESENT CONSUMPTION *per week* | PREWAR CONSUMPTION *per week* |
|---|---|---|
| Meat | 3 lb. | 2.4 lb. |
| Milk and cream | 3.6 qt. | 3 qt. |
| Cheese | 2.2 oz. | 1.7 oz. |
| Eggs | 7.3 | 5.7 |
| Fresh fruit | 2.8 lb. | 2.7 lb. |
| Canned and frozen fruit | 11.9 oz. | 6.1 oz. |

From these figures it can readily be seen that the food intake in America is considerably greater than before the war.—*From New York Times, January 4, 1948.*

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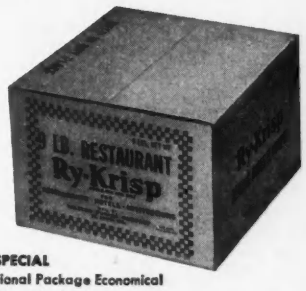


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# Current Literature

*Contributed by Janette C. Carlsen, Janet E. Engebretsen, and Ethel M. Miller, Dietary Department, The Johns Hopkins Hospital; Mrs. Quindara Oliver Dodge, Women's Educational and Industrial Union, Boston; Mrs. Martha Nelson Lewis, Ohio State University Hospital; and the Journal staff.*

## AMERICAN JOURNAL OF THE DISEASES OF CHILDREN

*Vol. 74, October, 1947*

* Nutritional requirement of the adolescent and its relationship to the development of disease. J. A. Johnston.—p. 487.

**Nutritional Requirements of Adolescents.** In this discussion of growth rates, metabolism, and food requirements as related to adolescence, the author brings out these points:

(a) The smooth decline in the rate of oxidation from childhood to maturity is interrupted during the period of adolescence. Both sexes display a diminution in the rate of decrease in oxidation which can be interpreted as a relative increase in metabolism. The pronounced changes in the rate of growth, in turn, favor an increase of hypothyroid states, which are frequently noted in the postpuberty years. The author discusses the use of thyroid in these cases and points out the danger of too much thyroid, resulting in interference in the storage of nitrogen and calcium.

(b) The period of maximum growth in the girl, which usually precedes the onset of menstruation by about one year, is accompanied by high retentions of calcium and nitrogen. The decelerative phase of growth is characterized by correspondingly low storage of these substances. The diminished ability to store nitrogen and calcium at this time may be an important factor in undermining nutrition, resulting in lowered resistance to disease. Suggestions are given for optimal intakes of calcium and vitamin D. In connection with calcium metabolism, disorders of the bone are described and dietary recommendations are made.

(c) Obesity is not basically a problem of adolescence; usually the tendency can be anticipated, and it can be expected that it will become exaggerated with the adolescent spurt of growth. This period of obesity is not a result of hypothyroidism; a diet high in protein and calcium and low in calories can be effective.

(d) The relation of adolescence to infection is demonstrated by the incidence of the adult type of tuberculosis in individuals whose nutritional state has been affected adversely during the decelerating phase of growth.

(e) Adolescent girls suffer many problems connected with the menstrual cycle. Any departure from normal in habits of nutrition may be reflected in menstrual abnormality.

## THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES

*Vol. 214, October, 1947*

* Hepatic calculi. A. Bassler and A. G. Peters.—p. 422.

*Vol. 214, November, 1947*

* Relapse of patients with pernicious anemia receiving folic acid. O. C. Hansen-Pruss.—p. 465.

**Hepatic Calculi.** Liver stones, or hepatic calculi, are probably more common than diagnosis indicates; most of them are discovered when an operation is performed or during a necropsy. Infection, changes of cell membranes, dysfunction of the nervous system, or disturbed metabolism may cause hepatic calculi. Pain, fever, chills, jaundice, and gastric disturbances are manifestations of liver stones, as well as liver enlargement. In cases where the stones are not in the biliary system, a low-fat, high-protein, high-carbohydrate diet with adequate vitamin intake is prescribed. In severe cases, surgery is necessary.

**Folic Acid.** Two patients with pernicious anemia were treated with folic acid and both relapsed after usual doses. Larger doses of folic acid failed to bring a response in either case. Concentrated liver extract, administered for eight days, brought a favorable response in both cases. It would seem that folic acid given by mouth lacked some of the properties contained in purified liver extract administered parenterally.

## THE AMERICAN JOURNAL OF NURSING

*Vol. 47, November, 1947*

* Clinical experience in dietherapy in the nursing curriculum. R. E. Sperry and D. Eakle.—p. 764.

*Vol. 47, December, 1947*

The clinic patient's nutrition needs. R. E. Lloyd.—p. 817.

**Diet Therapy for Nurses.** During the past four years a plan for the clinical practice and instruction of the student nurse in the diet kitchen has been developed at the Harris College of Nursing, Fort Worth, Texas. This article contains a description of the preparation which a student nurse receives in nutrition before starting her four weeks of practical experience in the diet kitchen. The routine followed during the four-week period is explained. Illustrations of a conference on dietary problems and of the diet kitchen experience record are included.

## ANALYTICAL CHEMISTRY

*Vol. 19, November, 1947*

Chemical tests of quality of fish. G. J. Sigurdsson.—p. 892.

*Vol. 19, December, 1947*

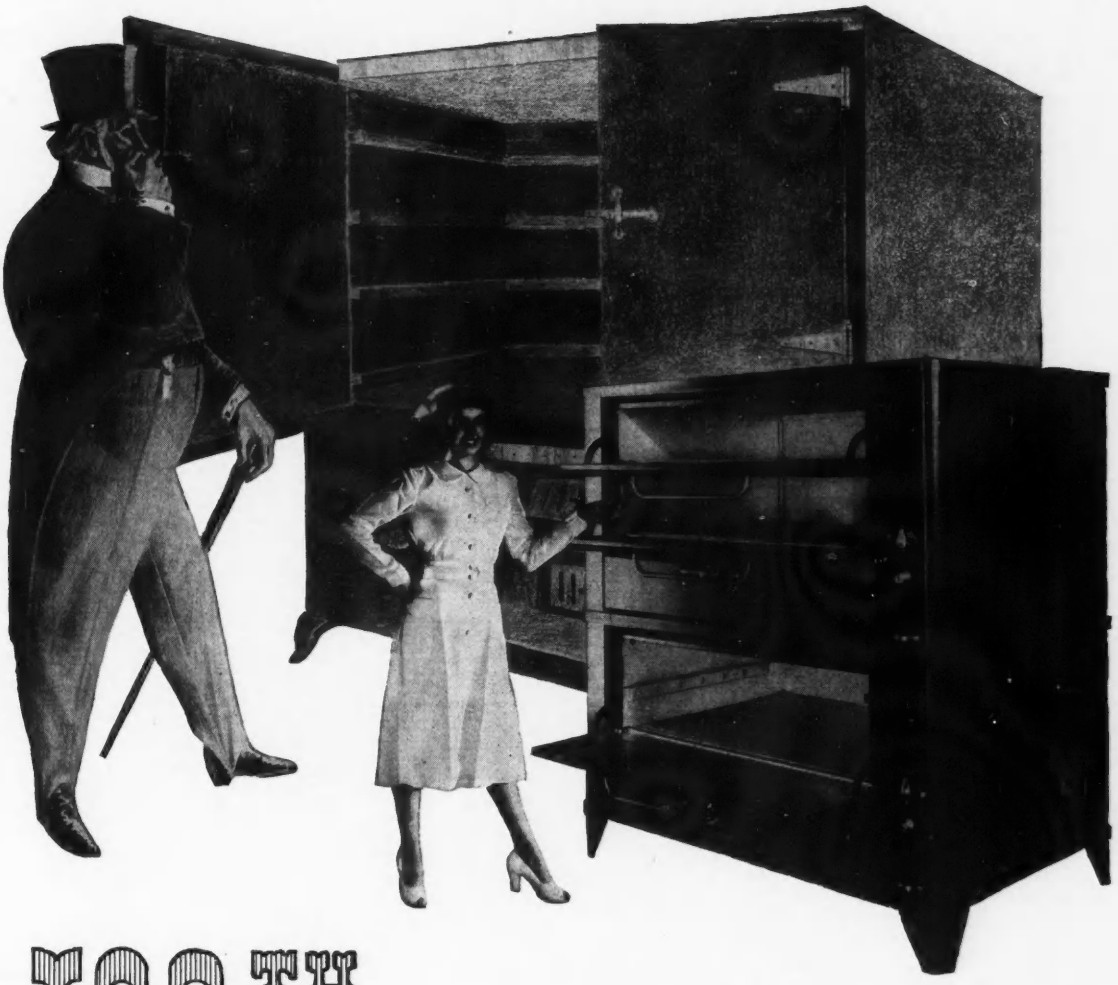
Symposium on statistical methods in experimental and industrial chemistry.

* Introductory remarks. B. L. Clarke.—p. 943

Technique for testing accuracy of analytical data. W. J. Youden—p. 946.

* Design of experiments in industrial research. H. M. Smallwood.—p. 950.

**Introductory Remarks.** Although statistical techniques have been greatly improved within recent years, they have not been given as wide application as they deserve. Modern statistical methods have a great deal to offer in both experimental and applied chemistry. For instance, by using the improved techniques, a chemist can be shown how to design his experiments so as to obtain the most useful



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body of data. He can also be shown how to organize these data for the most eloquent presentation. Statistics can be used also in helping the manufacturer, the processor, and the packager of chemical products to determine, in the shortest possible time, the existence of trends that may result in substandard products. This symposium was organized in order to gain more appreciation for the value of the use of statistics.

**Design of Experiments.** Modern industries often require research in fields in which undesirable sources of variability cannot be eliminated. Consequently, careful planning of a group of experiments is necessary in order that their combined results will yield a maximum amount of information for the work expended. Standard designs have been invented, one or more of which are capable of handling almost any problem. Two of the most useful types of design are described—the "block experiment" and the "factorial experiment." To illustrate the block experiment, an example is given of the work of a nutrition chemist in attempting to determine which of four diets will best nourish growing pups. Another example is given for the factorial experiment. In conclusion, analysis of variance is discussed.

## ANNALS OF INTERNAL MEDICINE

*Vol. 27, November, 1947*

Allergy: trends and their implications. S. M. Feinberg.—p. 723.
* The management of hypertension. P. D. White.—p. 740.

**Management of Hypertension.** Education of the hypertensive patient is the first step in treatment; doctors now tell most patients the true picture of their condition. Adjustment of work, rest, relaxation, and diet are most important. Diet of one sort or another has been used frequently. One of the most effective which has been found is the low-calorie diet. Loss of weight and lowering of blood pressure go hand in hand, so diet has proved beneficial. Low-protein diets have been tried; the most recent example is the rice and fruit diet of Kempner, which has been successful in many cases which responded to nothing else. Strict limitation of salt in the diet is also a current procedure. Some drugs have aided patients, as has the newest surgical procedure, the sympathectomy. It is hoped that something easier than either the rice diet or surgery will be found in the near future, since high blood pressure causes so much disability and death.

## BULLETIN OF THE JOHNS HOPKINS HOSPITAL

*Vol. 81, November, 1947*

* The influence of hypervitaminosis A on bone growth. T. E. Van Metre Jr.—p. 305.

**Vitamin A and Bone Growth.** Rats fed large doses of vitamin A showed definite retardation of longitudinal growth of the long bones. At the same time the rats lost appetite and weight which indicated that other tissues changed as well as bones. The reason for change in growth processes is still unexplained. Retardation of bone growth was proportional to the amount of vitamin A given.

## FOOD RESEARCH

*Vol. 12, September-October, 1947*

Antioxidant effect of soybean flour in frozen pastry. A. Overman.—p. 365.
* Survival of food-poisoning Staphylococci on nut meats. W. W. Smith and S. Iba.—p. 400.
* Vegetable crops in relation to soil fertility. VI. Calcium contents of green leafy vegetables.—p. 405.

**Staphylococci and Nut Meats.** Nut meats may be of public health significance as the source of food-borne pathogens. Methods of shelling, handling, and storing, and the chemical nature of nuts can easily result in their gross contamination. Several studies have indentified *Staphylococcus aureus* as the cause of food poisoning from nuts. Nuts are stored at a wide variety of temperatures because of their relative stability. The experiments reported in this paper were devised to study the influence of temperature on the survival of food-poisoning *Staphylococcus aureus*. Using pistachio nut meats the following observations were made: (a) At refrigerator temperature *Staphylococcus aureus* slowly died out, but survived longer than 141 days. (b) At room temperature *Staphylococcus aureus* increased in number for nine days, and then decreased until sterility occurred in ninety-nine days. (c) At 37°C., the maximum count was reached within 48 hr. after which there was rapid destruction. Viable *Staphylococcus aureus* was not detected after sixty-three days.

**Calcium in Green Vegetables.** Green leafy vegetables are listed among the "protective foods." However, there are important nutritional differences between certain greens. Greens of the mustard family (kale, mustard greens, and turnip tops) are superior to those of the goosefoot family (spinach, Swiss chard, beet greens, and New Zealand spinach). Because soil fertility is a factor influencing the nutritive value of crops, this study was made to determine the comparative values of calcium of green vegetables which were grown under controlled conditions in colloidal clay cultures. In general, there was an increase in the calcium concentration of the crops when the calcium supply of the substrate was increased. The members of the mustard family had a much higher percentage of calcium than those of the goosefoot family. The differences as related to the calcium contribution to the human diet were magnified by the high oxalate content in the goosefoot greens.

## THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

*Vol. 135, December 20, 1947*

* Amino acid utilization in the surgical patient. P. R. Cannon.—p. 1043.

*Vol. 135, December 27, 1947*

Glutamic acid. Editorial.—p. 1155.

**Amino Acids for Surgical Patients.** Undernutrition in the surgical patient may be due to an inadequate ingestion of dietary essentials, or to "conditioning factors" which impair the metabolic mechanisms. To further complicate the situation, both causes may operate. For this reason the diet of the surgical patient is of prime importance, both in composition and utilization. The question posed by the author is: "How may a surgical patient be best supplied with all dietary essentials, before and after operation, in order to restore the depleted tissues most quickly and completely to their original integrity?"

Experiments on animals have indicated that tissue synthesis requires enough calories to facilitate the conversion of amino acids into tissue protein, but above a certain level, additional calories are largely superfluous. Furthermore, to accomplish tissue synthesis, all of the essential amino acids must be available at approximately the same time. For optimal utilization of amino acids in tissue synthesis, each meal should be well balanced with respect to its content and relative proportions of essential amino acids.

The facts presented in this paper give emphasis to certain theoretical advantages of protein hydrolysates and protein concentrates in surgical practice. However, complete utilization of the amino acids depends on the efficiency of the synthesizing mechanisms. The synthesizing cells must have free access to an available supply of energy, vitamins, and minerals, and they must be unharmed by "conditioning factors." Although protein concentrates and hydrolysates are important, high quality natural protein should also be given its proper place.

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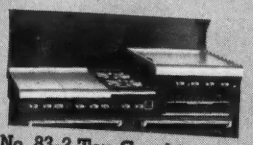

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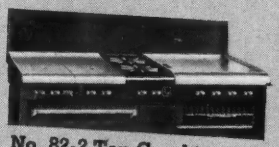

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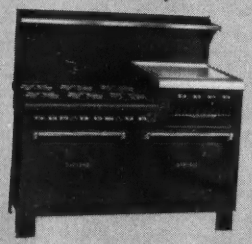

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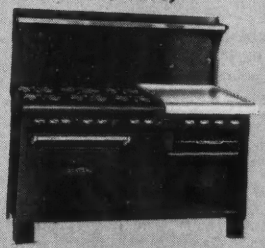

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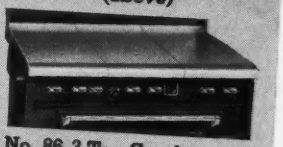

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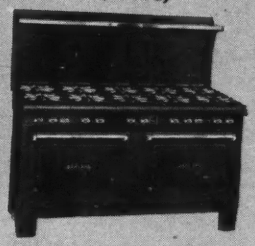

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## THE JOURNAL OF BIOLOGICAL CHEMISTRY

*Vol. 171, December, 1947*

* A study of the normal distribution of ascorbic acid between the red cells and plasma of human blood. F. Sargent.—p. 471.
* The effect of thyroid on the conversion of carotene into vitamin A. R. M. Johnson and C. A. Baumann.—p. 513.
The tryptophan content of meat. K. A. Kuiken, C. M. Lyman, and F. Hale.—p. 561.
The estimation of serum vitamin A with activated glycerol dichlorohydrin. A. E. Sobel and S. D. Snow.—p. 617.

**Ascorbic Acid in Blood.** This report deals with the interrelation of the ascorbic acid concentrations in the plasma, red cells, and whole blood as determined in the cases of twenty-six young, healthy adults. Results were expressed in terms of milligrams of ascorbic acid per 100 cc. of plasma and red blood cells, and then recalculated in terms of milligrams of ascorbic acid per 100 cc. of water. It was found that the ratio of concentration of ascorbic acid in the cells to that in the plasma depended upon the ascorbic acid concentration in whole blood. The experiment also suggested that ascorbic acid forms a relatively stable bond with a protein fraction of the red cell, and a loose bond with a protein of the plasma.

**Thyroid Activity and Carotene.** A number of studies have suggested that a functioning thyroid gland is necessary for an animal to convert carotene into vitamin A. There is also a general impression that the administration of thyroxine increases the need for the vitamin. In the experiments reported here rats were depleted of vitamin A and at the same time brought into either hypo- or hyperthyroid states. Standard amounts of carotene or vitamin A were then fed, and the storage of vitamin A in the liver and kidneys was determined chemically. When vitamin A was fed, approximately the same amount was stored in hypo- and hyperthyroid rats as in normal rats. However, when carotene was fed, hyperthyroid animals accumulated greater stores of vitamin A than did normal rats. On the other hand, hypothyroid rats stored very little vitamin A. It would seem that the chief effect of an altered thyroid metabolism is upon the amount of vitamin A formed from carotene, rather than upon the efficiency with which vitamin A is retained in the body. Further experiments in which thyroxine was administered to hypothyroid rats showed that when the hypothyroid condition was overcome, animals fed carotene stored approximately as much vitamin A as the control groups. Thus these experiments suggest that the effect of thyroxine on preformed vitamin A is relatively minor; apparently the need for the vitamin is not increased by the use of thyroxine. Another study, made on rats whose basal metabolic rates were increased by administration of 2, 4-dinitro phenol, indicated that altered carotene metabolism associated with thyroid dysfunction is not due to changes in the basal metabolic rate *per se*, but is brought about by some other physiological action of the thyroid gland.

## THE JOURNAL OF CLINICAL INVESTIGATION

*Vol. 26, November, 1947*

* The relation of sodium chloride to hypertension. G. A. Perera and D. V. Blood.—p. 1109.

**Sodium Chloride and Hypertension.** It has been claimed that the addition or removal of salt from the diet fails to influence the blood pressure level significantly. Further study of this problem is reported here. Under controlled conditions of diet and activity, observations were made on patients with uncomplicated hypertensive vascular disease. Under a regime of rigid restriction of sodium chloride a slight decrease in "resting" blood pressure resulted. When large amounts of sodium chloride were ingested, a slight rise of "resting" blood pressure was noted in five of the six subjects. There is nothing to suggest that the small changes in "resting" blood pressure associated with rigid restriction of sodium chloride are of therapeutic significance, or that prolonged restriction will exert any influence on the natural history of this disorder.

## JOURNAL OF HOME ECONOMICS

*Vol. 39, November, 1947*

* Care of children with rheumatic fever. R. L. Jackson.—p. 557.
Some Illinois food consumption patterns. C. Fitzsimmons and N. L. Perkins.—p. 572.

*Vol. 39, December, 1947*

* Soybeans are here to stay. J. B. McCay.—p. 629.
* Training for social welfare and public health. L. K. Addiss and M. M. Heseltine.—p. 637.

*Vol. 40, January, 1948*

* Trends in dietary practices of college women. M. W. Lamb and C. M. McPherson.—p. 19.

**Children and Rheumatic Fever.** This study was made to determine the recurrence rate of rheumatic fever in 266 children. As part of the study, an appraisal was made of each patient's economic and social situation. A third environmental factor which was considered was the dietary. Patients were classified according to the way they followed the prescribed diet. Of all the environmental factors rated, the most significant association was seen between the level of dietary care and the rheumatic recurrences. The dietary elements most commonly deficient were protein, vitamin D, thiamine, and minerals. The degree of dietary deficiency appeared to be related to the incidence and degree of heart damage. Observations made here emphasize that every effort should be made to improve the general living conditions of rheumatic children.

**Soybeans.** Interest in soybeans has gradually declined since the end of the war. This is unfortunate from the standpoint of the present-day world food supply. However, there is still a possibility that the soybean will gain favor, for there are a number of advantages to its use. These advantages are brought out by the author. Not only is the nutritional value high, but it also has the ability to hold moisture, as in bakery products. Soybeans are often used in such products as soups, meat products, and candy bars. Foreign countries are becoming familiar with the possibilities of the product, too. There is every reason to believe that with proper education regarding its use, the soybean can become a staple in the American diet.

**Training for Social Welfare and Public Health.** A joint committee of the American Dietetic Association and the American Home Economics Association has been compiling information and recommendations on the training of home economists for positions in the fields of social welfare and public health. Information obtained from thirty-six home economists and nutritionists who have pioneered in these fields has been tabulated along two main lines: (a) the nature of their present position and (b) their training and experience with an evaluation of its adequacy for that position. The results of the study are discussed in some detail, and suggestions are given as to the training and experience recommended for home economists and nutritionists engaged in social welfare and public health work.

**Dietary Practices of College Women.** A survey was made at Texas Technological College to determine whether education in nutrition results in better dietary practices. The food consumption of sixteen women was studied. The method of collecting the data is described and detailed charts and tables of the results are included. It was found that a higher-than-standard consumption prevailed of the three groups of foods which have been given most emphasis by nutritionists. These food groups were: (a) green and

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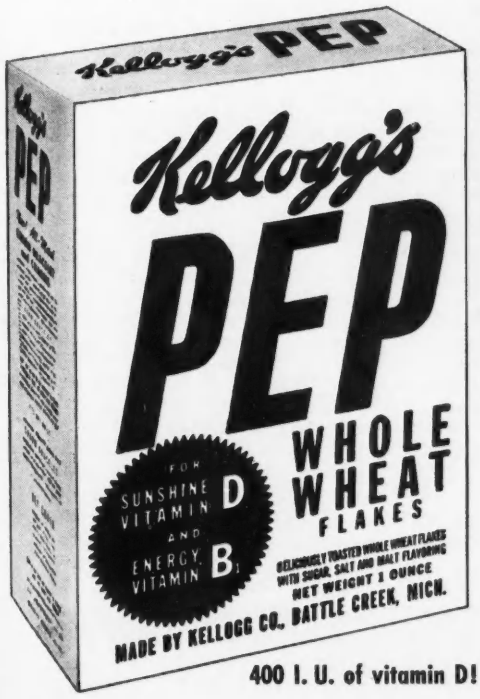
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yellow vegetables, (b) citrus fruits and tomatoes, and (c) milk and its products. Intakes of fat and sugar were higher than recommended, and meat consumption was below that recommended. However, the quality of the selection of meat helped to provide an adequate nutrient intake. This study suggests that the diets of college women are improving.

## THE JOURNAL OF LABORATORY AND CLINICAL MEDICINE

*Vol. 32, December, 1947*

* Metabolism of women during the reproductive cycle. XIV. The utilization of pantothenic acid during lactation. M. N. Coryell, M. E. Harris, S. Miller, H. H. Williams, and I. G. Macy.—p. 1454.

* Metabolism of women during the reproductive cycle. XV. The utilization of biotin during lactation. M. N. Coryell, M. E. Harris, S. Miller, M. M. Rutledge, H. H. Williams, and I. G. Macy.—p. 1462.

A nutrition survey of Viennese civilians under U. S. occupation in 1945. C. S. Davidson, H. L. Wilcke, H. D. Fein, and P. J. Reiner.—p. 1470.

**Pantothenic Acid and Lactation.** Pantothenic acid was determined in five-day composites of food and 24-hr. collections of milk and urine of seven multiparas during two five-day periods immediately postpartum. Nine nursing mothers were also studied in the same manner during seventeen five-day periods at intervals during the production of mature milk. The average daily intakes of pantothenic acid ranged from 6.9 to 9.5 mg. During the first ten days postpartum, daily secretions of pantothenic acid increased in direct proportion to the increase in the volume of milk. For the first five days postpartum, the average net intakes of six women exceeded the respective daily excretions in urine; during the next five days the average daily urinary excretion by four women was greater than average net intakes. During periods of mature milk production, the average daily secretion in milk and excretions in urine were 49 to 103 per cent of the intake; 32 to 89 per cent of the pantothenic acid appeared in the urine.

**Biotin and Lactation.** Studies similar to those described in the preceding article were made to determine the utilization of biotin during lactation. Values for biotin in the mother's milk for the first four days following parturition were too low to be reliable. During the second five days both concentration and daily secretion of biotin in the milk varied widely among seven women: the range of variation was 0.24 to 25.17 mcg. per day. During the periods of mature milk production, averages of 2 to 14 per cent of total biotin intakes were found in the milk secreted during the five-day periods. From 15 to 70 per cent of the intakes of biotin was found in the urine.

## THE JOURNAL OF NUTRITION

*Vol. 34, December, 1947*

* Some observations on beef cattle affected with generalized edema or anasarca due to vitamin A deficiency. L. L. Madsen and I. P. Earle.—p. 603.

* The nutritive value of canned foods. XXV. Vitamin content of canned fish products. J. B. Neilands, F. M. Strong, and C. A. Elvehjem.—p. 633.

* The influence of pteroylglutamic acid on gastrointestinal defects in sprue. A study of interrelationships of dietary essentials. W. J. Darby, E. Jones, H. F. Warden, and M. M. Kaser.—p. 645.

The effects of caloric restriction on skeletal growth. P. Handler, G. J. Baylin, and R. H. Follis, Jr.—p. 677.

* The effect of added thiamine on growth, vision, and learning, using identical twins. E. C. Robertson, C. M. Tatham, N. F. Walker, and M. R. Weaver.—p. 691.

**Beef Cattle and Vitamin A Deficiency.** Prolonged vitamin A deficiency in cattle may result in generalized edema. The condition is often referred to as anasarca. This report presents statistics showing that 651 beef carcasses were condemned for anasarca by federal meat inspectors during the period of July, 1941, to December, 1946, inclusive. Other symptoms of vitamin A deficiency were found to be prevalent among cattle with anasarca in the corn belt area. Occurrence of symptoms resulted after a long fattening period in dry lot, when the cattle were fed either stored or new corn in combination with a roughage of low carotene content, such as oat hay or straw. Cases of anasarca were readily produced experimentally by feeding a carotene-deficient ration or a grain ration containing 80 per cent of a new-crop yellow corn together with oat straw as roughage. By providing a source of carotene in the feed the disease was alleviated.

**Vitamin Content of Canned Fish.** Six species of canned fish—Atlantic mackerel, Atlantic sardines, tuna, salmon, Pacific mackerel, and Pacific sardines—were tested in this study. Determinations were made of the vitamin A, vitamin D, thiamine, riboflavin, pantothenic acid, biotin, nicotinic acid, pyridoxine, and folic acid content of the various fish. No appreciable amount of vitamin A was found in the flesh of any of the fish except salmon. Small amounts of vitamin A were contained in the oils from Atlantic mackerel and sardines. The thiamine and folic acid contents of the fish were generally low. Riboflavin, pantothenic acid, and biotin were present in fair amounts. The samples proved to be good sources of nicotinic acid and pyridoxine. All species examined were good sources of vitamin D.

**Pteroylglutamic Acid and Sprue.** Previous studies made by these authors have indicated that pteroylglutamic acid seems to exert a favorable influence upon the gastro-intestinal abnormalities found in sprue. This paper contains additional data to substantiate this belief. Six patients with sprue were observed during seven remissions following therapy with pteroylglutamic acid. Each remission was characterized by relief of glossitis, regeneration of the lingual papillae, cessation of diarrhea, and gain in weight, as well as hematologic improvement. The numerous interrelationships of pteroylglutamic acid with other vitamins and food factors were demonstrated, as follows: (a) A return toward normal glucose tolerance following therapy was seen in five instances. (b) In six cases of remission, a gradual increase in the serum carotene concentration was observed, and improved vitamin A absorption and increased prothrombin concentration were demonstrated in two cases. (c) Increased concentrations of plasma tocopherol were observed in two instances, and a decreased loss of fat in the stool occurred in the one patient who was studied repeatedly. These findings are compatible with the interpretation that pteroylglutamic acid exerts a favorable influence on the primary gastro-intestinal disorder in sprue and thereby permits the correction of many secondary deficiencies which occur. Chronic sprue responds less completely to pteroylglutamic acid than does the more acute disease.

**Effect of Thiamine on Growth, Vision, and Learning.** Reports have been made which indicate that supplementing the diet with thiamine can improve the vision and ability to perform certain psychological tests. In this study forty-four pairs of identical twins, ranging from seven and one-half to fifteen and one-half years of age, were used as test subjects. One member of each pair received 2 mg. of thiamine each day. Thirty-six pairs of twins were observed for four and one-half months. Twenty-five pairs of the twins were kept in the study four and one-half months longer (nine months in all). The group receiving thiamine for the shorter period made superior gains in height, weight, manual dexterity, and prolonged memory test scores. These results were of questionable statistical significance. In the groups studied for nine months, no gains of statistical significance were evident in any of the tests. It is not clear why the control group "caught up" with the group who received the thiamine supplement during the longer period.

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## THE JOURNAL OF PEDIATRICS

*Vol. 31, October, 1947*

Some factors which influence the duration of breast feeding. M. A. Norval —p. 415.

* Dental caries experience in postwar Italy (1945). II. Among teen-age children in Naples. M. Massler and I. Schour.—p. 431.

*Vol. 31, December, 1947*

* The adequacy of artificial feeding in infancy. S. S. Stevenson.—p. 616.

**Dental Caries in Postwar Italy.** One hundred and sixty-two children, ages ten to eighteen years, living in Naples, were examined for dental defects. It was found that the prevalence of dental caries was twice as low as that found in children of similar ages in the U. S. Since most of these children were malnourished, the relation between good nutrition and a protective influence against dental caries is not borne out. The low intake of refined sugar in Italy and the high consumption of refined sugar in the U. S. may in part explain the prevalence of caries. The role of vitamin B deficiency in depressing the incidence of caries should also be considered.

**Artificial Feeding in Infancy.** The advantages and disadvantages of breast feeding versus artificial feeding are carefully outlined and discussed. The most notable difference between the dietary of the two lies in the fact that the breast-fed baby receives more vitamin A and ascorbic acid and seems to utilize these vitamins better, or to have less need of them.

## THE LANCET

*Vol. 2, December 20, 1947*

* Diet and disease in the subarctic. A. C. Duncan.—p. 919.

**Diet and Disease in the Subarctic.** Dr. Duncan has noticed during his fourteen years of service as the only physician and surgeon in an area of the Yukon that the inhabitants do not suffer from rheumatic fever or glomerulonephritis. Toxemias of pregnancy are very rare. The people in this area eat a high-protein diet which includes much meat. The author concludes that rheumatic fever, glomerulonephritis, and toxemias of pregnancy can all be regarded as reactions of protein-starved connective tissue to metabolites of infection.

## THE MILITARY SURGEON

*Vol. 101, October, 1947*

* Powdered blood plasma and eggwhite perorally in therapy of gastrointestinal disorders. R. Barondes.—p. 243.

**Powdered Blood Plasma and Egg White Perorally.** The use of powdered blood plasma and egg whites as a cure of various gastro-intestinal disorders is not a proved fact, but rather a conclusion based on uncontrolled studies. A summary of evidence shows that: (a) Desiccated blood plasma, when given perorally, exerts beneficial effects on certain disorders, such as hyperchlorhydria, gastritis, enteritis, ulcerous and maligant processes, diarrheas, and so on. The dried plasma is well tolerated when mixed with palatable cool mixtures, the amount being gauged by the severity of the condition. Hot fluids cannot be used because of coagulation and consequent loss of therapeutic properties. Apple powder best disguises its flavor. (b) Intravenous administration of blood plasma holds promise. (c) Blood plasma is superior to and without the risk of the amino acids and protein hydrolysates in quickly combating hypoproteinemia, maintaining nitrogen balance, and restoring the electrolyte equilibrium. (d) Egg white, either fresh or prepared by high vacuum cold process as used in preparing blood plasma, is effective in alleviating symptoms of gastro-intestinal disorders. It helps maintain therapeutic efficacy and bacteriostatic concentration in the intestinal tract.

## PHYSIOLOGICAL REVIEWS

*Vol. 27, October, 1947*

* Body size and metabolic rate. M. Kleiber.—p. 511.

**Body Size and Metabolic Rate.** This article contains a very detailed discussion of the history of the development of the relationships of the body size and metabolic rate. It is suggested that when the concepts concerned with the relationship of body size and metabolic rate are clarified and that when not only the methods of measurement, but also those of reporting the data are sufficiently standardized, the comparative physiology of metabolism will be of great help in solving the problem of the regulation of the rate of cell metabolism.

## QUARTERLY BULLETIN OF NORTHWESTERN UNIVERSITY MEDICAL SCHOOL

*Vol. 21, Winter Quarter, 1947*

* On the function of insulin: a general theory. H. R. Jacobs.—p. 329.

**The Function of Insulin.** As no comprehensive theory of the function of insulin has yet appeared, an attempt has been made in this paper to formulate a new general theory of insulin's action. Concepts of carbohydrate metabolism and the respiratory quotient were reviewed. As a result of this analysis, certain conclusions were made: (a) The basic fuel of the body is fat. (b) It does not appear that carbohydrate is oxidized directly for energy; the role of carbohydrate is that of a substrate which must first be converted to fat, with glycogen as a temporary depot along the way, if carbohydrate is to be utilized for a fuel material. (c) The respiratory quotient is invalid, because it furnishes no acceptable evidence of what fuel is being oxidized. (The concept of the respiratory quotient has formed the basis of much of the argument concerning the function of insulin.) Arguments are given to support the theory that insulin is a general hormone for synthesis, and that the carbohydrate defect in diabetes is but one manifestation of failure of the insulin function.

## SCIENCE

*Vol. 106, December 26, 1947*

* The effects of vitamins on phosphorus metabolism in the chick embryo. 1. Vitamin D and the utilization of inorganic phosphorus. H. Branson, H. W. Banks, Jr., and L. B. Dodson.—p. 637.

Inadequate maternal nutrition and hydrocephalus in infant rats. L. R. Richardson and J. DeMottier.—p. 644.

*Vol. 107, January 2, 1948*

A simple micromethod for rapid extraction of lipids. S. C. Hsiao.—p. 24.

*Vol. 107, January 16, 1948*

Inactivation of nutrients by heating with glucose. A. R. Parron and E. G. Hill.—p. 68.

**Effect of Vitamin D on Phosphorus Metabolism.** This study is part of a series in which quantitative data are being obtained concerning the effects of vitamins on the metabolism of phosphorus compounds in the developing chick embryo. The results of work with vitamin D are given here. It was shown that vitamin D accelerated the overall metabolism of inorganic phosphorus. The effect was most marked in the adenosine, creatine, and phosphatide phosphorus fractions. There was no marked influence of vitamin D on the specific activity of the inorganic phosphorus fraction.

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## AMERICAN RESTAURANT MAGAZINE

*Vol. 31, November, 1947*

Layout pattern for a grill. G. G. Zipfel—p. 41.
* Here's one way to check breakage two ways. J. B. O'Meara.—p. 44.
* Hard water is hard on everything, especially profits! W. H. Steinberg.—p. 58.

*Vol. 31, December, 1947*

From hamburgers and coffee to hamburgers and coffee and complete restaurant service at Medarts. B. R. Merrill.—p. 33.
* Work or starve.—p. 88.

**Breakage Reports.** The discussion in this article is centered around two report forms. One is a breakage report to be filled in by the individual breaking the equipment; the other is a breakage report giving the total weekly breakage. Detailed instructions for filling out the reports are included.

**Hard Water.** Many difficulties are encountered by a food service unit located in a hard water area. Many foods, when cooked in hard water, tend to become tough and unappetizing. In washing, hard water requires excessive amounts of soap. Dishes, after cleaning, are cloudy. Furthermore, hard water boosts fuel and maintenance bills. The value of water softeners in eliminating the water problem is pointed out, and a few statistics are given. An illustrated map shows the distribution of hard water in the U. S.

**Work Incentives.** In answer to the question, "What makes men *want* to work?" a number of suggestions are listed. The following incentives are of major importance: (a) the pay check, (b) the pleasantness of the work and proper working conditions, (c) promise of a good future, (d) rewards for extra effort, (e) assurance that an employer will not exploit those he hires, (f) desire to attain personal goals, (g) interest and fascination in the work, and (h) pride in the organization for which one works. Each of these points is elaborated upon in the discussion.

## BAKER'S HELPER

*Vol. 88, November 1, 1947*

* Malt is versatile. W. E. Broeg.—p. 81.
Fruit cakes with invert sugars. F. P. Graw.—p. 130.

**Malt.** This is the first in a series of three articles on malt and its uses in bakery products. A general description of the enzyme is given, and the advantages it offers are described. Doughs which contain malt, ferment more uniformly and produce excellent "oven-spring." Because of its hygroscopic value, malt correctly used aids in prolonging oven freshness. Malt enzymes also make soluble proteins more readily available in the digestive system. Suggestions are given for using malt in straight dough white pan bread, malted butter and egg raisin bread, malted raisin bread, soft sponge white bread, fast straight dough, and 2½-to-3-hr. straight dough.

## COLLEGE AND UNIVERSITY BUSINESS

*Vol. 3, December, 1947*

There are ways to simplify kitchen work. O. M. Thomas.—p. 29.

*Vol. 4, January, 1948*

Technics for dealing with employes. V. H. Sorensen.—p. 14.
* Dining hall looks to the future. M. Dorton.—p. 23.
* Before you boost food prices. A. W. Janzen.—p. 24.
* Organizing a food service. J. H. Vorhies.—p. 26.

**New College Dining Hall.** The construction of the new dining hall at McMurry College, Abilene, Texas, is described here. The plans are illustrated, equipment in the kitchen and dining room is listed, and the construction data are given. The dining hall has a capacity for 1500 persons an hour.

**Before You Boost Food Prices.** Directors of college food services owe it to their students to keep their food prices as low as possible without lowering standards. It is becoming more and more difficult to do this. However, a careful analysis of personnel production and efficiency may help to solve the problem. The author gives illustrations showing how efficiency was increased and money saved in the food service department of the University of Texas. Kitchen ventilation was improved, thus increasing the efficiency of the cooks. The customer group was studied; as a result of this study, an extra cafeteria line was set up and the menu was simplified. In addition, the seating arrangement in the dining room was reorganized to accommodate a greatly increased volume with no additional overhead costs. A systematic procedure for clearing tables was developed. Breakage was practically eliminated, and it was possible to eliminate between twenty and twenty-five maids. Fat and shortening costs were cut in half, and by careful checking of portion sizes and by weighing all deliveries, further economies were accomplished. The many suggestions given in this article can be applied to any food service unit.

**Organizing a Food Service.** The administration of Wayne University, Detroit, has been planning and organizing a housing and feeding program for its students. Certain policies have been determined, and these are presented. The discussion on staff organization points out decisions concerning the food service department, including who will engage the food service director and her staff, who will pay the salaries, and what the qualifications and duties of the staff will be. Specifications for employees are set forth, cost control methods are presented, and the food service director's role in purchasing is explained. Procedures for menu patterns and food service practices are listed, and the situation in regard to equipment and layout is presented.

## FOOD FREEZING

*Vol. 2, October, 1947*

* Are frozen food prices getting in line with canned and fresh foods? I. K. Marvin and G. Loft.—p. 757.
Shopping habits can influence sales of frozen foods.—p. 767.

*Vol. 3, November, 1947*

* The Food and Drug Administration and the frozen food industry. A. D. Herrick.—p. 16.
*What effects do cooking time and packaging have on frozen boiled shrimp? H. Lewis.—p. 48.

*Vol. 3, December, 1947*

* Turkey steaks for year round sales.—p. 32.
McIntosh apples frozen for institutional use.—p. 44.

**Frozen Food Prices Versus Canned and Fresh.** A detailed study of frozen, fresh, and canned food prices in October, 1945, indicated that: frozen foods were more generally available month to month than fresh and canned foods; certain months it costs more to eat fresh than frozen foods. The cost of canned foods is still in many cases below that of frozen foods, but the frozen food has better appearance, flavor, and texture. In Syracuse, New York, a study was made of twenty-five foods. It was found that frozen foods have been more available than fresh or canned foods. Between the first half of 1946 and the first half of 1947, eight frozen items decreased in cost while prices of sixteen increased. Fresh food prices increased more than those of frozen food. The increase in price of canned foods was less than that of the comparable fresh products. The existence and then the ending of the price controls affected the 1946–47 price relationship.

**Frozen Food Industry and Food Standards.** Members of the frozen foods industry are viewing with interest the formulation of standards for certain frozen foods. These standards are being promulgated under the authority of

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the Food Standards Committee of the Food and Drug Administration. These prospective standards are, at present, in the "pre-hearing" stage. The final definitions and standards of identity will include a description of food in terms of ingredients, characteristics, and method of preparation. They will also represent the very lowest level of quality at which the article is entitled to be sold under the defined name.

**Frozen Boiled Shrimp.** Workers at the Louisiana Agricultural Experiment Station have shown that cooked shrimp offer another outlet for the seafood industry, provided certain precautions are observed. The most satisfactory cooking procedures are described in this article. It was found that peeled, boiled shrimp were acceptable if kept in frozen storage no longer than three months; unpeeled, boiled shrimp kept satisfactorily for six months. Six weeks was the maximum storage period for shrimp cocktail and shrimp creole. As with other frozen foods, moisture-vapor-proof containers are essential for maintenance of high quality during the storage period.

**Turkey Steaks.** Turkey has long been accepted by the American public, but the processing and merchandising of the native bird has always been on a very narrow seasonal basis. One reason for this is the size of the bird. The difficulty has been alleviated somewhat by the introduction of turkey steaks, which are suitable for just one meal for a family. Described in this article is the procedure followed in preparing turkey steaks. They may be broiled or fried. Several frozen food processors are now marketing their own branded products.

## FOOD INDUSTRIES

*Vol. 20, January, 1948*

* Retention of vitamins in low acid canned foods. J. F. Feaster, M. D. Tompkins, and M. Ives.—p. 82.
Cheese quality improvement influenced by technology. G. P. Sanders.—p. 94.
* Prevention of bone darkening in frozen-packed chickens. J. C. Woodroof and E. Shelor.—p. 116.

**Vitamin Retention in Canned Foods.** An evaluation has been made of the effects of new processing techniques on the nutrients in canned foods. Particular attention has been given to the "low-acid" foods whose *p*H values fall below 4.5. As a result of studying the effects of the "high-short" and the agitating methods on the thiamine and niacin retention in vegetable products, the following conclusions were reached: (a) The niacin contents of pea, Lima bean, green bean, and carrot purées, and cream style yellow corn were not appreciably affected by processing by either the "high-short" or conventional methods. However, the thiamine retentions of the samples processed by the "high-short" technique were considerably higher than the retentions in the conventionally processed samples. Tests made on white corn, processed by the agitating method, showed that niacin retentions were consistently high and compared with retentions obtained by the conventional and "high-short" methods. As for the thiamine content of corn processed by agitating, values were 30 to 60 per cent higher than those obtained from samples processed by the conventional method. Furthermore, the corn samples were superior in color and flavor.

**Bone Darkening in Frozen Chickens.** Darkening of bones in frozen chickens has been widely observed, especially in the South and the East where broilers and fryers are most popular. Little has been known of its cause or prevention. It has been found that sex is not a determining factor; neither is the type of package or wrapping material. Bone darkening is not related to killing during any season of the year, and it does not affect the aroma, texture, or flavor of the meat. It is not associated with "souring" or other types of spoilage due to bacteria. The darkening is characterized by a bloody discoloration of the bone and adjacent tissues. During cooking the color changes to a deep grey or brown, or even black. A series of experiments was conducted in an attempt to determine the cause of bone darkening. It was found that darkening of the bone was confined to young chickens. The length of time required for chilling dressed chickens before freezing had little or no effect upon bone darkening. Blanching cut-up chicken before freezing prevented it, but adversely affected the flavor. Storing the chicken at a temperature of −15° F. or lower prevented bone darkening almost entirely.

## HOSPITAL MANAGEMENT

*Vol. 64, December, 1947*

* What are the qualifications for hospital food service employes? J. M. Melgaard.—p. 86.

**Qualifications for Food Service Employees.** For the purposes of the analysis given here, food service employees are divided into four groups, covering the phases of food production, meat preparation, food service, and maintenance. The various positions which may be classified under each heading are given, responsibilities are pointed out, and a somewhat detailed list of qualifications is included. In addition, possibilities for promotion are suggested, and interdepartmental agreements for which employees are responsible are noted. The lists given in this article should be especially helpful as a guide in hiring new employees and in increasing the efficiency of present workers.

## HOSPITALS

*Vol. 22, January, 1948*

* Three hospitals try experiment in sharing dietitian. J. W. Marine.—p. 97.

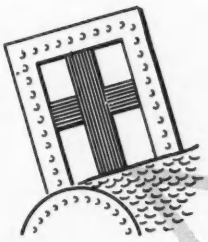
**Sharing a Dietitian.** Three small hospitals in Michigan have solved the problem of obtaining the services of a dietitian, and at a fraction of what it would ordinarily cost. During the war, the administrator of the twenty-bed hospital at Marshall, Michigan, asked one of the town's residents, a former dietitian, to spend one day a week at the hospital. Gradually a dietary consultation program was evolved. Now three hospitals in the area receive the benefit of a dietitian's services and are advised in problems of administration, therapeutics, and education. The consultant directs the food purchasing, menu planning, and dietary personnel management for each hospital. She also teaches patients how to follow their diets. (Part of this phase of her work is carried out in connection with the clinic service offered by the hospitals.) General diets for the hospitals are planned on a weekly basis, and patients are visited weekly to determine their food preferences. As there is an interchange of patients with the University of Michigan Hospital at Ann Arbor, special diets in the three small hospitals have been standardized as much as possible to compare with those used at the University Hospital. Salary arrangements for the consultation service are described in the article.

## HOTEL MANAGEMENT

*Vol. 52, December, 1947*

Building business with postcards. F. F. Harris.—p. 33.
* Principles of kitchen layout. VIII. Arranging kitchen equipment. A. W. Dana.—p. 50.
Modern fashions in breakfasts. M. Casteen.—p. 52.

**Arranging Kitchen Equipment.** Preparation kitchens require sinks of various types if high standards of efficiency and sanitation are to be realized. Hand sinks, mop sinks, washing and preparation sinks, and pot washing sinks are discussed. The need for adequate working space is emphasized and specific suggestions for the placement of var-



*Armor showing ailettes, A. D. 1320*

**Ailettes,** *nothing more than plates of forged iron or steel, were worn over the coat of mail to protect shoulders against blows aimed at the headpiece and glancing off.*

# *for extra* PROTECTION!

JUST as ailettes gave added protection, so does this seal or mention of the Wisconsin Alumni Research Foundation on a product give you extra assurance. For this seal warrants the Vitamin D content. It guarantees that the product is regularly subjected to the Foundation laboratory tests to make certain it meets the high standards and rigid requirements. For almost a score of years the medical profession has advised its patients to "look to the Foundation Seal" with full confidence.

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ious types of sinks are given. The topic of refrigeration is also included. Three types of refrigeration for kitchen preparation and service are compared—walk-in, reach-in, and under-counter reach-in or drawer. For temporary storage of prepared hot foods, the open hot water bath has been the most conventional method in the past. The advantages of the electrically or gas-heated food storage warmer are pointed out. Various types of steam tables are described, and a diagram is included to show an innovation in insets for hot food serving tables. These square and rectangular insets afford maximum flexibility in the arrangement of several foods and permit the control of the quantities of food to be held at any one time. Explanation for the locations of salad and sandwich preparation is given, and the equipment for the cold meat section is described.

## HOTEL MONTHLY

*Vol. 55, November, 1947*

* An employer's check-sheet for building better employee relations. R. Tyo.—p. 58.

Hotel kitchen clock turned to 1947 with new equipment and methods.—p. 62.

*Vol. 55, December, 1947*

Australian food training program, producing expert hotel cooks and meat cutters.—p. 50.

**Better Employee Relations.** Confidence and cooperation are necessary if employee relations are to be what they should. A check list which contains a number of practical suggestions for improving employee relations is given in this article. In addition to such factors as working conditions, training programs, employee benefits, and grievance procedures, considerable emphasis is given to small gestures which can be made by management to promote good feeling. A few of these gestures are sending birthday and anniversary cards, arranging special treats, such as lemonade on hot days and coffee on cold days, and subscribing to memberships in YMCA and YWCA for employees' children.

## THE ICE CREAM TRADE JOURNAL

*Vol. 43, November, 1947*

Planning the operation of retail drive-in ice cream stores. O. H. Glazier.—p. 66.

* Research. B. I. Masurovsky.—p. 76.

**Egg Yolk in Ice Cream.** Egg yolk is a required ingredient in French ice creams. To produce 1 million gal. of finished French ice cream, 77,000 lb. of egg yolk are required. Egg yolk is available in several forms: frozen, dehydrated, or powdered. Methods of preparing these types of egg yolks are described. The importance of egg yolk as an emulsifier is pointed out.

## INSTITUTIONS MAGAZINE

*Vol. 21, December, 1947*

* Price of kitchen equipment tied to labor costs.—p. 53.

**Kitchen Equipment and Labor Costs.** The cost of food service equipment is influenced by principles of construction, by operation, and by maintenance. However, the major increase in the cost of equipment is due to increased labor costs and the maintenance of the equipment after installation. This article shows how manufacturers have been able to maintain reasonable prices despite the high cost of labor. The design of equipment is receiving more attention today. As a result, the cost of operation is being cut. Because of the current emphasis on sanitation, equipment is being designed to afford easy cleaning. Points to look for in selecting satisfactory equipment are stressed, and the advantages of round corner design are shown. By reviewing the fundamental factors involved in the design of fixed equipment, the author indicates the trend in modern food service equipment.

## THE MODERN HOSPITAL

*Vol. 70, January, 1948*

Planning the formula room for the present and the future. E. Larson.—p. 83.

* Nutrition education in the outpatient department. F. V. Krone.—p. 104.

Hospital cooks go to school. T. J. McGinty.—p. 106.

**Nutrition in the Out-Patient Department.** What points should be stressed by the dietitian who teaches nutrition in a clinic? What methods are most successful in gaining the cooperation of the patient? These questions are discussed by one clinic dietitian, Frances V. Krone, of Cincinnati General Hospital. She breaks down the work of teaching as follows: (a) Convince the patient of his need for a diet. (b) Instruct the patient in the details of his diet. (c) Determine success by following the progress of the patient. Interviews, group discussions, and illustrative material all have a place in the teaching program. Definite suggestions along these lines are given.

## THE NATION'S SCHOOLS

*Vol. 40, November, 1947*

Students aid lunch program. J. Hodgson.—p. 56.

* This job of lunchroom management. J. N. Jardine.—p. 57.

**Lunchroom Management.** Because of the importance of the school lunch program, it is vital that individuals in charge of school lunchrooms be qualified for their positions. Requirements for directors of school lunch are not, as yet, standardized. Some city school systems give an apprentice training course in lunchroom management to their prospective managers. A summer course in school lunchroom management is given in some schools. Dietetic interns in three administrative courses approved by the American Dietetic Association, through assignments in school lunch work, may obtain some training in this field. They are: the University of Washington, Seattle; Women's Educational and Industrial Union, Boston; and Texas State College for Women, Denton.

There are four general classifications for school lunchroom managers: the home economics teacher who manages the lunchroom on a part-time basis; the administrative dietitian who is full-time manager of the lunchroom; the director or supervisor of the school lunch program for the city school system; and the state supervisor of school lunchrooms. The work of the full-time manager or state supervisor is described in some detail and the advantages to be gained in school lunch positions are pointed out.

## PERSONNEL

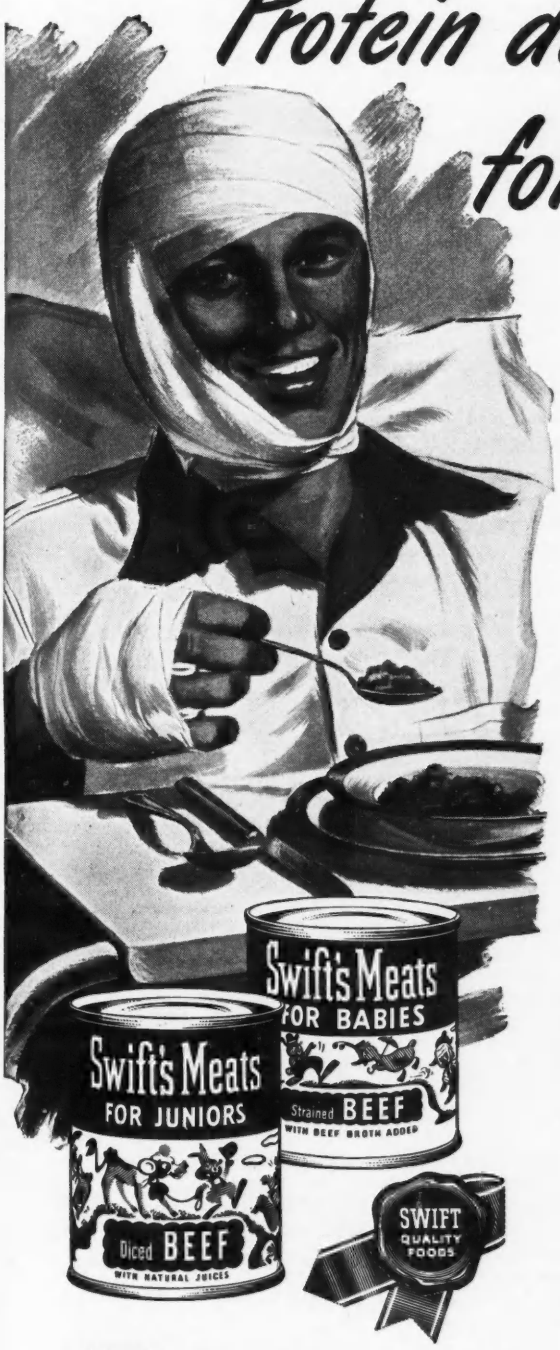
*Vol. 24, November, 1947*

* Employee cooperation to increase productivity. E. Dale.—p. 165.

What management can do within the plant to control absenteeism. W. Dietz.—p. 219.

**Employee Cooperation.** The American Management Association is conducting a survey to obtain information on the extent and methods of employee-management cooperation. From the 250 replies which have been received thus far, the following preliminary conclusions have been made: (a) Cooperation is more successful on a departmental basis than on a plant-wide basis. (b) The areas of cooperation are chiefly those in which the possibility of conflict is small. (c) The motivations, expectations, and results of cooperation are usually quite general in character; efforts toward cooperation frequently create better labor relations. (d) The methods and techniques of cooperation are, for the most part, the tested and proved ones and include training programs and conferences. (e) Emphasis is generally placed on the continuation of established systems of rewards and the maintenance of established frontiers of management authority. Most replies stressed purely economic inducements to increase productivity.

# "Protein destruction following injury"




"Certain types of injury produce a general reaction on the part of all tissues. An outstanding indication of such a reaction is an intense *protein breakdown* which begins soon after the injury and may last for several weeks thereafter. *Fracture* of the major bones, *extensive burns*, *abdominal trauma*, and some *operative procedures* are the most common offenders in this regard. The negative nitrogen balance which follows injury is difficult to compensate for. *Extremely high protein* intakes are needed to minimize the loss of bodily tissue. It should be remarked that in the case of burns, protein is lost not only by excretion via the urine, but also the oozing of protein-containing fluid from the injured skin surfaces."*

## When protein supplementation presents a problem... SWIFT'S STRAINED MEATS

When soft, high-protein diets are indicated, many physicians now use Swift's Strained Meats. These all-meat products provide a palatable source of complete, high-quality proteins, B vitamins and minerals. Originally developed for infant feeding, the meats are strained fine enough to pass through the nipple of a nursing bottle—may easily be used in tube-feeding. Swift's Strained Meats are convenient to use—ready to heat and serve. Six kinds: beef, lamb, pork, veal, liver and heart. Three and one-half ounces per tin.

**Also Swift's Diced Meats**—for high-protein diets requiring foods in a form less fine than strained, these tender, juicy cubes of meat are highly desirable.

**From "The Importance of Protein Foods in Health and Disease," the new, physicians handbook on protein feeding. This booklet, prepared by a physician, in conjunction with the Nutrition Division of Swift & Company, is available to you without cost. Simply fill out the coupon below.*

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*All nutritional statements made in this advertisement are accepted by the American Medical Association's Council on Foods and Nutrition.*

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Please send me my free copy of "The Importance of Protein Foods in Health and Disease."

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*City*.....*Zone*.....*State*.....

## PRACTICAL HOME ECONOMICS

*Vol. 25, December, 1947*

* Home economics for primary school children. C. Livingston.—p. 659.

**Nutrition for Primary School Children.** Work in foods and nutrition for children in the primary grades is part of an experimental program at a school in Newark, New Jersey. The purpose is to promote an interest in foods by working with them. Pupils from kindergarten through fourth grade participate in the program, and the main emphasis for study is determined through conferences of the home economics instructor and the grade teacher. Two or three times a week, for a period of three weeks, the children are taken to the kitchen to work with the foods they are studying in the classrooms. Foods from the Basic 7 groups are stressed, and simple foods are prepared and tasted. For the fourth graders, the nutrition unit is correlated with the social studies unit. Not only are the children taught principles of nutrition, but they are also instructed in table manners, how to set a table, and how to handle silverware. Hints as to how a nutrition program can be carried out in other schools are included in the article.

## QUICK FROZEN FOODS

*Vol. 10, October, 1947*

Freezing French fries in Maine.—p. 68.

*Vol. 10, November, 1947*

Orange concentrate . . . is it at last the answer to the frozen orange juice problem? E. W. Williams.—p. 51.

* Rabbit freezer packs 40,000 pounds a week.—p. 63.

*Vol. 10, December, 1947*

The frozen food critic.—p. 62.

* Storing frozen fish.—p. 69.

* Locker plants to pre-cook foods for service in restaurant.—p. 108.

**Frozen Rabbit.** Modern methods and equipment at a new rabbit freezing plant in California are paying off in a high speed, clean processing operation. The plant is designed to turn out 40,000 lb. of dressed meat weekly. It is packaged in cut sections, and the net weight of each box of rabbit meat is written on the outside of the carton. The domestic rabbit meat market is now principally on the West Coast, but it is the belief that new freezing facilities will make possible quantity shipments throughout the country.

**Storing Frozen Fish.** The problems encountered in successful freezing of fish are not unlike those existing with other frozen foods. In order to have a good frozen product, the raw material must be of high quality. Temperature control is vital (−15° F.), since higher temperatures are favorable to growth of bacteria. This not only renders food unpalatable, but unfit for consumption from a health standpoint. In storage of fish, it is essential that the product be stocked in such a manner that the proper circulation of air throughout the carton is assured.

**Locker Plant Service for Restaurant.** One restaurant which operates a tremendous frozen food locker for the convenience of its customers, is launching a novel experiment. Meats are seared under an open flame, quick frozen, then stored in the locker plant. When ready for use, they are placed in an electronic oven and are ready to serve in less than 1 min. It is hoped that eventually entire meals can be prepared in this manner.

## WHAT'S NEW IN HOME ECONOMICS

*Vol. 12, January, 1948*

* Record forms and their use. G. E. Hochmuth.—p. 112.

**Record Forms.** Although school lunch supervisors and managers are required to make out a number of report and record forms, the value of this procedure cannot be underestimated. The author, who appreciates the need for these various forms, describes a typical school lunch program, which is under centralized management. A table is included which lists the various records used. They fall into three categories: (a) personnel records; (b) purchasing, storeroom, kitchen, and service records; and (c) accounting and financial records. Emphasis is given to the fact that these record forms serve as a food cost control. They also provide an adequate basis for an overall and a detailed view of the school lunch program, accounts, and other pertinent subjects for school lunchrooms, individually and collectively. Furthermore, they require information that will provide data for recapitulations and summaries that are to be submitted to other offices.

## *Effect on the Teeth of Taking Iron*

A brief review of recent periodical medical and dental literature fails to reveal any discussion of the effects on normal teeth or metallic restorations and fillings of taking iron in any of its various forms used in therapy. Years ago the opinion prevailed among physicians and dentists that taking tincture of ferric chloride or other forms of iron was injurious to the teeth. There appears to be no laboratory or clinical research to justify such an opinion. Apparently this opinion developed because of the staining of teeth which may result from taking solutions of iron unless taken through a tube and swallowed without its coming in contact with the teeth.

Research dentists and biochemists now seem to discount or minimize the former opinion of injurious effects of taking iron other than staining of the teeth. Various causes may account for the falling out of fillings, such as further decay and imperfect mixing. It has also been established that there is a certain amount of electro-potentiality between dissimilar metallic restorations in the mouth in which the saliva acts as a good electrolyte. Therefore in an individual who is taking iron and who has multiple or large metallic restorations fixed by cement containing oxyphosphate of zinc, it might be possible for some dissolution of exposed cement to occur in sufficient amount to cause loosening or falling out of the fillings. This accident would result from the local contact of iron, which might serve as the electonegative metal.

The general opinion now seems to prevail among research dentists and physicians that the injurious effects on fillings of taking iron were formerly overestimated or are approximately nil, except for the stains which may occur on the teeth and which can be removed by immediate brushing.—*From Queries and Minor Notes, J. A. M. A. 135: 1120 (December 20), 1947.*

# Use the liquid in the can

NUTRITIONISTS have long recognized that extraction of vitamins and minerals occurs when fresh foods are cooked in water (1). They have further pointed out that discarding the cooking water—the usual home practice—entails a loss of valuable, essential nutrients (2, 3).

Modern practice in commercial canning goes far in preventing these solution losses in the case of products which are packed in syrups and brines.

Such canned foods are cooked by the heat process accorded them while still contained within the hermetically sealed can.

A minimum of water is used, which also remains within the can, conserving for the consumer's use the extractable vitamins and minerals.

Tabulated below are vitamin values found in the solid and liquid phases of several canned vegetables (4). The results indicate that approximately one third of these vitamins are contained in the liquid portions. A parallel situation holds with respect to the minerals (5).

Physicians can effect a conservation of essential vitamins and minerals by urging housewives to serve the liquid in the can with the solid portion or use it in soups and gravies.

**Percentage Distribution of Water Soluble Vitamins in Canned Vegetables**

| | Ascorbic Acid | | Thiamine | | Riboflavin | |
|---|---|---|---|---|---|---|
| | Solid | Liquid | Solid | Liquid | Solid | Liquid |
| Asparagus, green | 60 | 40 | 62 | 33 | 71 | 29 |
| Beans, green | 64 | 36 | 67 | 33 | 76 | 24 |
| Beans, Lima | 56 | 44 | 68 | 32 | 76 | 24 |
| Carrots | 66 | 34 | 66 | 34 | 74 | 26 |
| Corn, whole kernel | 61 | 39 | 67 | 33 | 78 | 22 |
| Peas | 63 | 37 | 66 | 34 | 70 | 30 |
| Spinach | 62 | 38 | 69 | 31 | 76 | 24 |

(1) J. Home Economics *28*, 15 (1936)
(2) Food Research *8*, 115 (1943)
(3) Food Research *7*, 300 (1942)
(4) J. Nutr. *28*, 131 (1944)
(5) J. Am. Diet. Assn. *21*, 354 (1945)

AMERICAN CAN COMPANY CANCO 230 Park Avenue, New York 17, New York

This is the third in a new series of articles which will summarize, for your convenience, the conclusions about canned foods, which authorities in nutritional research and canning technology have reached. We want to make this series available to you, and so we ask your help. Will you tell us on a post card addressed to the General Research Laboratory, American Can Company, Maywood, Illinois what phases of canned foods knowledge are of greatest interest to you. Your suggestions will help determine the subject matter of future articles.

*The Seal of Acceptance denotes that the statements pertaining to nutrition in this advertisement are acceptable to the Committee on Foods and Nutrition of the American Medical Association.*

# News Notes

**FAO News.** Arrangements have been completed for the Food and Agriculture Organization of the United Nations to supply 28 bu. of hybrid corn seed for field tests in Europe. The seed will be sent to experiment stations in Austria, Czechoslovakia, Hungary, Italy, Poland, and Yugoslavia in time for spring planting this year. Successful experimentation, it is felt, will result in gradually increased amounts of European corn production for both crops and seed.

. . . . . .

Three FAO representatives are now visiting Latin American countries with the object of studying their needs and the possibilities of regional organization in Latin America.

. . . . . .

Announcement has also been received of a mission which left for Siam early in January. The mission, comprising eight experts from China, India, Indonesia, the United Kingdom, and the U. S., will investigate methods of growing more rice and increasing exports, developing and controlling water supplies, improving marketing and distribution of farm products, improving statistical services, combating rinderpest disease among cattle and water buffaloes, and improving forest conservation and management. This is the third FAO mission sent to a member country. Chairman of the mission is Dr. R. H. Walker, Dean and Director of the Agricultural Experiment Station, Utah State College, Logan.

. . . . . .

On January 6, Ethiopia joined FAO, bringing to fifty-five the number of nations which are members. Ethiopia took part in the United Nations Hot Springs Conference on Food and Agriculture in May, 1943, which led to the establishment of FAO, and was therefore eligible for original membership without having to await the formal approval of the Annual Conference, which is the governing body of FAO.

. . . . . .

Noble Clark has been appointed Deputy Director-General of FAO for a five-month period. Mr. Clark, who is Associate Director of the Agricultural Experiment Station, University of Wisconsin, headed an FAO mission to Poland last year. The creation of this post was necessitated by the increasing amount of work falling upon the Director General, Sir John Boyd Orr, due to the establishment of the World Food Council and the development of regional work throughout the world.

. . . . . .

At Baguio in the Philippines, the FAO is holding a series of three meetings to consider nutrition and fisheries, and the rice situation in Southeast Asia. A fourth meeting to be held after the middle of March will deal with the problem of organizing FAO's regional work in the Far East. It is hoped that action growing out of these conferences will represent a long step forward in overcoming the critical rice situation and the overall food shortage of Asia. At the rice conference, consideration will be given to the recommendations for a world-wide rice conservation campaign made by Rice Study Group which met in India last year.

. . . . . .

A regional FAO conference of Near East countries was held in February in Cairo. At this meeting a concrete plan of action to help raise food production in this region was made.

**Dietetic Interns Graduate.** On January 15, nine dietetic interns completed their training at the *Johns Hopkins Hospital*, Baltimore. At a special ceremony, Dr. Edwin L. Crosby, Director of the hospital, presented certificates to the following girls: Betty Jane Baldwin, Charlotte Flessner, Margaret Frederick, Mildred Frampton, C. Joyce Hamilton, Mary Lou Weber, Virginia Gamble, Margaret Barryman, and Norma MacRae.

At the *Cook County School of Nursing*, five dietetic interns were honored at a graduation dinner on January 28. The theme of the program was the "New Look," which was carried out in the place cards, menus, and in the speeches of the evening. Place cards were Gibson-girl figures made of construction paper, while the menus were exceptionally clever, with samples of cloth, scissors cut from black paper, a miniature tape measure, facsimile spools of thread, and pattern pieces made from X-ray film attached to the cover. Topics for the speeches were as follows: "Selecting the Material"; "The Basic Pattern"; "Construction"; and "Developing the New Look." Presentation of the certificates and pins was made by Millie E. Kalsem, Director of the Dietary Department. The graduates are: Frances Ann Bell, Illinois Institute of Technology; Betty Jo Clayton, Texas State College for Women; Helen Dziatlik, Iowa State College; Catherine Hughes, Southeastern Louisiana College; and Merle Rhodenbaugh, University of North Dakota.

Six dietetic interns completed their training at the *Veterans Administration Hospital, Hines, Illinois*, on January 30. At the exercises held in honor of these graduates, Dr. K. A. Carroll, Manager of the hospital, spoke on the "Dietitian's Responsibility." Clare Childress, Chief, Education Section, Central Office of the Veterans Administration in Washington, was also a featured speaker. Her topic was "Future of the Dietitian in the Veterans Administration." The graduates are: Joyce L. Chamberlain, Jane E. Happel, Catherine B. Littell, Marceile J. Sander, Evelyn V. Schuber, and Elaine Sobel.

**Swedish Dietitian Visits A.D.A. Office.** In January the headquarters office of A.D.A. enjoyed meeting Ebba Bjernald, Nutrition Consultant for the City Hospitals in Stockholm, Sweden. Miss Bjernald is studying in this country through the American Scandinavian Foundation. Much of her work here has been with the Stouffer organization in Cleveland and in Minneapolis, where she helped to organize the afternoon coffee hour service and showed the bakers how to make the Swedish cookies. While in Chicago she visited a number of the leading hospitals to learn about the operation of their dietary departments and the school lunch program of the Chicago Public Schools. She has also visited in Detroit, New York City, and Washington, where arrangements were made for her to see dietary departments.

**A.D.A. Members to Go Abroad.** Two dietitians have recently undertaken assignments of an international character which should prove both interesting and educational. *Evelyn Anderson* left the middle of January to join a small mission going to China for the United Nations Children's Emergency Fund.

*Ruth Green*, therapeutic dietitian at the University of Kansas Medical Center, is going to Newcastle, Australia, where, for a year to fifteen months, she will combine study and work at the Newcastle Hospital. She will be working under the Hospitals Commission of the New South Wales government.

**Rosina Vance.** On January 16, Rosina Vance passed away at the Baptist Hospital, Winston-Salem, North Carolina, where she was chief dietitian. She had been active in professional affairs, having served as a member of the Placement Bureau Board of A.D.A. from 1938 to 1945. One of her first positions in the field of dietetics was with Lulu Graves, first president of A.D.A. She later worked in San Juan, Puerto Rico, but most of her professional life was spent in Boston as Chief Dietitian at the Massachusetts General Hospital.

Rosina was in Philadelphia in October for the A.D.A. convention, eager to participate and to enjoy life, even though she knew more of her future than most

# DOUBLE-TOUGH TUMBLERS WIN 3 TO 1

## SIX WEEKS' STUDY BY YORK RESEARCH EXPERTS SHOWS CONVINCING RESULTS!

### Test Approved By American Hotel Association

**STAMFORD CONN.** — The breakage of Standard Annealed Tumblers in service is more than three times greater than that of Corning Double-Tough Tumblers, according to the York Research Corporation, specialists in Hotel Marketing Research, who have completed a six weeks' test in two New York City Hotels.

#### YORK SPECIALIZES

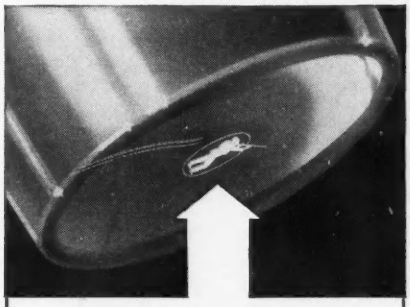
York Research Corporation, one of the leading marketing Research organizations in the country, specializes in the hotel field. This corporation serves as Technical Research Consultants for the American Hotel Association which has placed its stamp of approval on the recently completed "Tumbler Durability Test".

#### PLAZA AND LEXINGTON CHOSEN

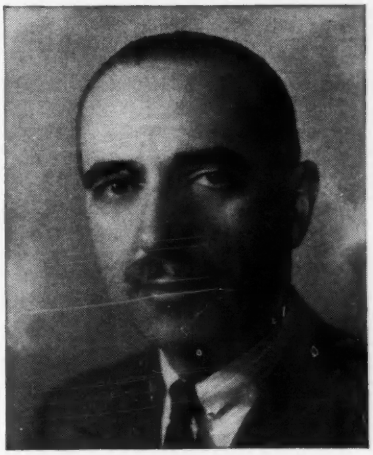
After investigation of 25 hotels in New York City, York selected the two which provided the best facilities for conducting a carefully controlled test. Using two brands of Standard Annealed Tumblers, identical in size and design to the Corning Double-Tough Tumblers, this study tested breakage under actual conditions prevailing in hotel operations.

#### UNBIASED RESULTS

The split-inventory method was used and careful inventories and checks were made every week for six weeks by York's field interviewers who are highly trained technicians and engineers. Results of the study showed: at the Plaza, the breakage of Standard Annealed 9 oz. high-ball Tumblers was 3.06 times as great as the identical (in appearance) Corning Double-Tough Tumblers; at the Lexington, the breakage of a different brand of Standard Annealed 9 oz. water tumblers was 4.3 times as great as the identical Corning Double-Tough Tumblers.



**THE WINNER!** This familiar little glass blower, the famous Corning Glass mark of top quality, bounced back three times as often as his competitors during the York test. He's stamped on the bottom of every thin, light, sparkling Double-Tough Tumbler and will cut *your* breakage costs, too.



**HOLCOMB YORK**
*President of the York Research Corporation, Hotel Marketing Research specialists.*

#### BIG SAVINGS

Mr. Holcomb York, President of the York Research Corporation, states, "This study conclusively shows that Hotels (and other tumbler users) can reduce breakage to a marked degree by replacing Standard Annealed Tumblers with specially processed Corning Double-Tough Tumblers." With Double-Tough Tumblers again available, you can make these savings yourself. See your Double-Tough Tumbler Distributor today. Place your order *now* for quick delivery.

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**CORNING GLASS WORKS**
**CORNING, N. Y.**

CORNING means A Research in Glass

*Corning double-Tough Tumblers*

people do. She knew how to live as well as to work, and she had a remarkable understanding of and interest in people, which meant that she had many friends. She was a charming and delightful person, noted among her friends as a raconteur.—*Beula Becker Marble, Boston, Massachusetts.*

**Eleanor Enright.** Word has been received in the JOURNAL office of the death of Eleanor Enright. Miss Enright first became a member of A.D.A. in 1928 when employed by the Washington Dairy Council, Washington, D. C. Other positions she has held have included a teaching position on the faculty of the Department of Home Economics, University of Maryland, and with the staff of the Industrial Feeding Division of the Department of Agriculture in Washington.

**Minnie L. Dames.** Last August, Mrs. Minnie L. Dames, an A.D.A. member since 1928, passed away in Detroit, where she made her home. For several years she served as dietitian at Freedman's Hospital, Washington, D. C., later moving to St. Louis where she was on the staff of St. Louis City Hospital and later of Homer G. Phillips Hospital. In 1939 she moved to Pasadena, California, but returned to the Midwest in 1945, settling in Detroit.

**Library Materials.** The following material is available to A.D.A. members from the Loan Library:

(a) School lunch menus for elementary and high schools in Chicago. Market order and costs are given.

(b) Three bulletins for school lunch managers prepared by the Bureau of Human Nutrition and Home Economics: *Quantities of Food for Serving School Lunches, Estimating the Cost of Food for a School Lunch,* and *Small Equipment for the School Lunch.*

(c) A handbook prepared by the Oklahoma School Lunch Division of the State Board of Education: *School Lunch Workshop Handbook for County Groups.*

**Food Supplies.** The Production and Marketing Administration of the Department of Agriculture has released the following list of foods expected to be plentiful during the month of March. Dietitians concerned with purchasing will undoubtedly find this information helpful, for foods in good supply are likely to be relatively less expensive.

*Fresh produce and fruits*

| | |
|---|---|
| Apples | Fish |
| Cabbage | Grapefruit |
| Carrots | Lemons |
| Celery | Oranges |

*Canned foods*

| | |
|---|---|
| Blended orange and grapefruit juice | Orange juice |
| Grapefruit juice | Peas (lower grades) |
| Grapefruit segments | Sweet potatoes |
| | Tomato juice |

*Dried foods*

| | |
|---|---|
| Apples | Prunes |
| Figs | Raisins |
| Peaches | |

*Frozen foods*

| | |
|---|---|
| Peas | Fish |

In addition to those foods listed above which will be plentiful, the following foods are expected to be *relatively* plentiful:

| | |
|---|---|
| Beans, Lima—frozen | Fruit spreads |
| Beans, snap—fresh | Lettuce |
| Cucumber pickles | Sweet potatoes—fresh |

**1948 Meeting of Canadian Dietetic Association.** The annual convention of the Canadian Dietetic Association will be held June 2 to 4 at the Mount Royal Hotel, Montreal. Members of the A.D.A. are cordially invited to attend.

**American Chemical Society Meeting.** The 113th national meeting of the American Chemical Society will be held in Chicago from April 19 to 23, at which several papers on recent advances in food technology, vitamins, and sugar will be presented. The session on "Food Technology" will deal with new canning and packaging techniques which will enhance flavor and nutritive value of processed foods. Other topics on the program are "Food Quality and Control," "Vitamin P," and "Metalloporphyrins and Heme Proteins."

**National Dairy Month.** According to an announcement by Alice M. Cooley, Director of Home Economics, National Dairy Council, June will be celebrated this year as Dairy Month. The theme of this promotion will be directed to the consumer with emphasis on the food value and economy angle, using the slogan, "Dairy Foods—Your Best Buy."

**Institutes for Dietitians.** Two institutes on dietetics have been scheduled for April by the American Hospital Association. One will be held in Buck Hill Falls, Pennsylvania, April 19 to 23, the other in Kansas City, Missouri, April 12 and 13. Both institutes have been planned to help administrators work closely with their dietitians in establishing sound and efficient departmental organization with resultant attractive, well-planned meals for patients.

The institute at Buck Hill Falls has been titled "Modernization of Food Service Facilities and Procedures in Hospitals." It will cover three important phases of dietary administration: good personnel organization and training, modernization of facilities and layout, departmental controls and costs, and the educational responsibilities of the hospital. An open forum is planned on in-service training of the dietitian.

The Kansas City institute was especially scheduled for administrators and dietitians attending the Mid-West Hospital Association meeting. This institute, which will meet at the Continental Hotel, will cover "Planning and Operating the Hospital Food Service." The agenda provides for discussion of personnel practices and organization, methods of leading good conferences, food

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service procedures, and analysis of the operation of a well-controlled department. A panel of experts will hold a forum on layouts and equipment. Additional attention will be given to the dietitian's responsibility to the administrator for efficient and economical service, menu planning suggestions for the small hospital, and food cost accounting.

**Second Community Nutrition Institute.** Syracuse University, Syracuse, New York, has announced a Second Community Nutrition Institute to be held July 5 to 17. Described as "an in-service course in public health nutrition," the Institute is also sponsored by the New York State Department of Health. It has been designed to meet the needs of community nutritionists, public health physicians, clinical dietitians, public health nurses, caseworkers, group workers, nutrition instructors, home economics teachers, and health teachers and educators. It has been planned so that those attending will have an opportunity to discuss their problems with experts, to exchange ideas with other workers in the field, and to bring themselves up to date on developments in this field.

**School Lunch Booklet.** At the 1947 Southern States Work-Conference on Education held last summer at Daytona Beach, Florida, one of the major projects was the development of a guide for use in bringing about more satisfactory policies and standards for school lunch programs. This work was done by a committee under the chairmanship of Thelma G. Flanagan, State Supervisor, School Lunch Program, Florida State Department of Education, Tallahassee. The guide developed by this committee has recently been published in the form of a thirty-seven-page booklet titled *School Lunch Policies and Standards*. The introduction stresses the fact that these policies and standards are considered tentative and subject to revision, and that later a handbook will be published incorporating any changes suggested. In considering standards and policies, the booklet has been divided into chapters which deal with the following phases of school lunch programs: educational aspects, organization and administration, food, food service facilities, personnel, finance, and evaluation. Copies may be obtained by writing to Mrs. Flanagan; in addition, a copy for loan purposes has been placed in the A.D.A. Library for the use of members.

Also at the conference last summer this school lunch committee worked out some suggested revisions of two government publications on school lunch. These have now been mimeographed, but are available only to school lunch people in the southern states. The suggested revisions pertain to Bulletin No. 19, 1946, of the U. S. Office of Education, titled *Planning and Equipping School Lunchrooms*, and to *School Room Facilities, One Room School*, issued by the Production and Marketing Administration of the Department of Agriculture.

**Quantity Recipe Booklet.** A forty-four-page, illustrated recipe book for quantity preparation of fish has been released by the Fish and Wildlife Service of the Department of the Interior. Prepared by Rose G. Kerr, Home Economist, Educational Section, Division of Commercial Fisheries, the recipes have been standardized for 100 servings. Separate sections are concerned with the purchase and preparation of fish, oysters, shrimp, clams, lobsters, and crabs. A special guide for use in buying fish is provided as well as information on the market forms of fish and shell fish, and the food value of fishery products. The last two sections in the publication cover sauces, stuffings, and garnishes for fish.

**New Recipe Book.** The JOURNAL office has received a copy of a recipe book which has recently been reissued by Waring Products Corporation. In it are included recipes for dishes in which the Waring Blendor is used in preparation. Recipes are divided into three large categories—"Recipes for Kitchen," Recipes for Children," and "Recipes for the Sick and Convalescent." The section on food for the sick and convalescent is sub-divided into four parts: between-meal nourishment, meat and vegetable timbales, special diets, and tube feedings. The section on recipes for the kitchen contains tempting suggestions for such things as bechamel sauce, crab bisque, and fruit soups.


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**New Publication.** In January the American Academy of Pediatrics started publication of a new monthly journal called *Pediatrics*. It will contain original articles on clinical pediatrics, nutrition, genetics, preventive medicine, psychology, nursing and medical sociology, education, and social welfare of children. Dr. Hugh McCulloch has been appointed editor-in-chief of the new journal.

**American Association of Cereal Chemists.** On January 1, *Biological Abstracts* began publication of a separate section devoted to abstracts of domestic and foreign literature in cereal chemistry and allied fields. This new section is being sponsored by the American Association of Cereal Chemists and the Millers National Federation.

**Dehydrofreezing.** Sliced apples and green peas, preserved by dehydrofreezing, have proved successful in the first extensive cooking and tasting tests conducted by the Western Regional Research Laboratory of the Department of Agriculture. The dehydrofrozen apples made excellent pies, and the peas, after cooking, tasted like cooked, freshly shelled peas and were as good as the best frozen peas. After six to twelve months in storage at —10°F., the dehydrofrozen peas had kept their color, flavor, and texture as well as frozen peas.

Dehydrofreezing is accomplished first by removing much of the moisture from the fresh food to save weight and bulk in packaging, transportation, and storage, and then the food is frozen to hold its qualities of flavor, color, texture, and food value. By removing moisture, fruits and vegetables can be frozen more successfully because there is less breakage of their tissues from the large ice crystals which form when more water is present. Moisture is restored by the water and used in cooking the foods.

**Effect of Freezing Canned Milk.** Dairy specialists of the Department of Agriculture say that freezing evaporated milk makes it unsuitable for most uses, and that it cannot be brought back to its original form after freezing. Freezing causes the milk to discolor, although it does not cause actual "spoilage," unless it expands the can enough to break the seal and let spoilage organisms enter. When evaporated milk is frozen, the effect is much the same as that when bottled fresh milk is frozen. The fat turns to oil at the top, the protein becomes partly insoluble, and the water separates as it does when milk sours. Also the water expands so that cans may swell and break, just as a bottle of milk may break when the milk freezes.

Sweetened, condensed milk, on the other hand, is not likely to be damaged by low temperatures which will freeze evaporated milk. The high sugar concentration of condensed milk results in a lower freezing point, and only a few ice crystals form, even at a temperature of zero. All of the water in the milk (28 per cent) will not freeze, except at very low temperatures.

**Frozen Peas.** In an effort to learn the causes of off-flavor in frozen peas, an investigation was carried on by the Western Regional Laboratory of the Department of Agriculture recently. Every step of the processing from harvesting in the field to freezing and storage was checked. In this way it was learned that most of the off-flavors could be traced to a delay between harvesting in the field and processing in the plant. The "vining" machine in the field cuts the plants, then threshes, and finally shells the peas. After this they are brought in bags to the freezing plant. The longer the period between removal from the pods and processing, the more pronounced is the off-flavor. It was found that by leaving the peas in the pod until just before blanching, the off-flavor was less noticeable. It is felt, however, by the workers in this laboratory that the solution to the problem is the development of new machines and methods of harvesting which will get the peas to the plant very rapidly.

**Storage of Frozen Meat.** Studies made by Kenneth F. Warner, Extension meat specialist of the Department of Agriculture, have shown that frozen pork should not be held longer than five or six months after being stored. When stored too long, the pork gradually becomes rancid and loses its best flavor. The meat becomes rancid faster when it is salted, so that storage time for frozen, cured meat should be shorter than for unsalted meat. To prevent pork remaining in the freezer too long, Mr. Warner suggests that the date of storage be marked on all packages put in the freezer.

Beef, lamb, and poultry hold their flavor longer than pork at a storage temperature of zero. Well-wrapped beef and poultry can be kept satisfactorily as long as a year.

**New Fruit Jelly Candy.** The Eastern Regional Research Laboratory of the Department of Agriculture in Philadelphia has developed a new jelly candy which, with the exception of sugar and corn sirup, is made entirely from fruit products. It is flavored with apple essence (also recently developed at this laboratory), and pectin from apples or citrus fruits is used to give the jellied consistency, at the same time requiring less sugar than is generally used in gum-type or jellied candies. Concentrated apple juice is also used.

A gum-type apple candy using cornstarch was also made and found to keep better, but it was not as delicate in texture or as fine in flavor as the pectin candy, which keeps well for only about three months, although it tends to dry out and harden on the surface. Other tests showed that when the candy is coated with chocolate, it keeps its moisture well, but the chocolate masks some of the apple flavor, although the combination of flavors is pleasant.

Commercial production of this candy, however, will have to wait until the candy industry adopts new processing methods which use lower heat and less open heating. With present candy-making methods of cooking in open vats at high heat, it is difficult not to lose the apple and other fruit essences because they are volatile.

## News of State Associations

**Kansas Dietetic Association.** The executive board of the Kansas Dietetic Association met for lunch at the Jayhawk Hotel in Topeka on January 24. Plans were discussed for a booth to be exhibited at various state conventions and events this year, including a field day for high school girls which will be held on March 6 by the University of Kansas City. The theme of the exhibit will be "Dietetics Continuously in the Spotlight," which will be illustrated by pictures in a spotlight. *Dietetics as a Profession*, the JOURNAL, "Dietitians in Demand," and a folder entitled "Dietetics Now Playing in the Spotlight" will be shown in the booth. A dietitian will be present to answer questions and to help in talking to prospective dietitians.

The Diet Therapy Section of the Kansas Association has completed, after two years' work, a pamphlet on formula procedure for mothers. It describes a simple, economical, and satisfactory method of making formula using the terminal sterilization method, which is suitable for any income group. The cover shows an attractive arrangement of the equipment used in making formulas. This pamphlet will be sold for a nominal charge.

The Kansas Dietetic Association and the Kansas City Dietetic Association will serve as sponsors of the Institute on Dietetics of the American Hospital Association which will be conducted in Kansas City, Missouri, April 12–13.

**Maryland Dietetic Association.** At the Christmas party of the Maryland Dietetic Association, held at Sinai Hospital on December 1, cash donations were collected for use in purchasing Care packages to be sent to Europe. On February 2, a special supper meeting of the Maryland Association was held at the West Baltimore General Hospital Nurses' Home to hear about the nutritional studies being conducted by the U. S. Public Health Service Nutritional Units. One of the six units now making surveys throughout the nation to determine the relationship between economic status and nutritional deficiencies is now doing investigations in various Maryland institutions. Dr. Clarence Valet, Medical Officer of the Unit, illustrated the physical signs of malnutrition and their supposed relationship to dietary deficiencies by means of slides. Alla Meredith, a nutritionist, and Rose Mansom, a nurse, also explained their work in connection with this survey.

**New Jersey Dietetic Association.** On January 28, the New Jersey Dietetic Association met at the Orange Memorial Hospital in Orange. The Professional Education Committee of the organization sponsored the meeting. Dr. A.

Dudley Dennison, a heart specialist and an authority on the subject, spoke on "The Need for Therapeutic Diet in Treatment of Cardiac Diseases." The second meeting of 1948 was held on February 26 at St. Barnabas Hospital in Newark. John Ebersole, President of the National Restaurant Association and speaker of the evening, took as his topic "The New Look in Food Service."

**New York State Dietetic Association.** The annual Mary Swartz Rose Memorial Lecture sponsored by the *Greater New York Dietetic Association* was held on February 17 at the New York Academy of Medicine. Speaker this year was Dr. David Rittenberg, Associate Professor of Biochemistry, College of Physicians and Surgeons, Columbia University. His topic was "Dynamic Aspects of Nutrition."

The Greater New York Dietetic Association will serve as one of the sponsors of the Institute on Dietetics to be conducted by the American Hospital Association at Buck Hill Falls, Pennsylvania, in April.

**Ohio Dietetic Association.** The *Cincinnati Dietetic Association* held open house on February 6, 7, and 8 for seniors from nearby colleges and universities. The guests were housed in three different hospitals. The first evening the seniors were entertained by the dietetic interns in the city at a buffet supper. At this party the interns explained about their internship—what they do, how they live, and so on. The following day was free, so that each senior might visit any nutrition department in Cincinnati that she might choose, whether in a hospital, a public utility, a social agency, or food clinic. In the evening there was a party which gave the college girls an opportunity to meet the various kinds of dietitians and really find out pertinent information about the profession. Later it is hoped that the directors of the schools from which the girls came will allow them to talk with other nutrition majors.

**Pennsylvania Dietetic Association.** On December 9, the Philadelphia Dietetic Association met. Guests for the evening were public health nurses, Red Cross instructors, community nutrition leaders, and social workers. Announcement was made by Julia Amerise that the Association, working in conjunction with the newly created Hospital Purchasing Pool of the Philadelphia Hospital Council, has set up a committee to work on the problems of food purchasing as they apply to the hospital dietitian. Dr. Robert Goodhart, Scientific Director of the National Vitamin Foundation, discussed the "Public Health Aspects of Recent Advances in Nutrition." Recent educational material was also on display.

At the January meeting of the Philadelphia group, emphasis was placed on public relations work. Dr. Philip Bonnet, Resident Director of the Lankenau Hospital, was guest speaker and stressed doing a good job before trying to publicize it. He believes that a good job, well done, will attract attention on its own merits, and that when interest and confidence is aroused, the public relations angle can be developed by contact and assistance.

Other activities of the Philadelphia Association are being coordinated with those of other groups. On February 13, the Hospital Council, the Hospital Purchasing Service, the Philadelphia Hospital Association, and the Philadelphia Dietetic Association sponsored "Food Institute Day," at which increased food costs were discussed. The Diet Therapy Section has been busy improving relations with the medical groups. They have arranged with the Metabolic Association to work more closely together and have responded to a request for assistance with an exhibit being planned for the next Open Forum of the Philadelphia Medical Society. The Diet Therapy Section may also prepare a series of lectures to be given to diabetic patients in the County Medical Building. A motion has also been approved for the Philadelphia Dietetic Association to become a member of the Health and Welfare Council, and further contributions have been made through the Federation of Women's Clubs for European relief projects. The Philadelphia group will be one of the sponsors of the Institute on Dietetics to be conducted by the American Hospital Association at Buck Hill Falls, Pennsylvania in April.

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**GRADE 10 POINTS** for each category in which you think this menu meets the requirements of a good breakfast.

— Good source of Vitamin $B_1$ and Niacin?
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This excellent breakfast pictured above meets every requirement for a good start-of-the-day-meal . . . thanks in good measure to Enriched 5 Minute "Cream of Wheat." A generous bowlful of this smooth, delicious cereal provides all the famed food-energy of good wheat . . . PLUS all the essential Iron needed daily . . . PLUS Calcium, Phosphorus, Vitamin $B_1$, Niacin and wheat proteins. Cooks to full digestibility—even for babies—in 5 minutes of boiling. Costs less than 1¢ a bowl. Try it with a topping of jam, jelly, syrup, brown sugar.

**FREE!** Valuable Nutrition Material! 1. Vitamin Food Chart; 2. Recipe Folder; 3. Baby Leaflet; 4. Special Diet Folder; 5. Quantity Recipe Cards. Write (stating quantity of each piece) to: The Cream of Wheat Corporation, 746 Stinson Blvd., Minneapolis 13, Minnesota.

A vocational guidance committee in Philadelphia has given one talk to the students at Temple University and plans later in the spring to launch an informational program which will be directed toward high school students and will include at least one radio program.

**The Virginia Dietetic Association.** At the fall meeting of the *Tidewater Dietetic Association* the following officers were elected: President-Elect Bertha Ide, Norfolk General Hospital; President, Gussie Cox, Norfolk General Hospital; Secretary, Theresa Jones, Maryview Hospital, Portsmouth; and Treasurer, Mary Wiggins, DePaul Hospital, Norfolk. In November the Tidewater group accepted an invitation from the Norfolk County Medical Association to attend its meeting at which Dr. W. T. Tompkins of Philadelphia spoke on "Diet During Pregnancy."

On December 18, the annual Christmas party of the *Richmond Dietetic Association* was held at the Hermitage Country Club. On January 12, the members were the guests of the dietitians of the McGuire Veterans Administration Hospital. Dr. John Powell Williams, Clinical Director of the hospital, gave a history of the progress of dietitians in Richmond. Dr. Reno Porter gave an address on the rice diet.

On January 1, the dietary department of Norfolk General Hospital began a weekly program of classes for dietitian's aides. This program is to be presented in the form of lectures given by the therapeutic dietitians, films on nutrition, discussions by the laboratory technicians and interns to acquaint the dietitian's aide with the work which they do in relation to the dietary department.

**Washington State Dietetic Association.** On November 1, the following new officers of the Washington State Dietetic Association took office: President, Virginia Saibel; President-Elect, Clare Belle Tavis; Vice-President, Eudora Fulkerson; Secretary, Doris Williams; and Treasurer, Dorothy Anderson. Members assisted the local Home Economics Association in collecting aid for various overseas relief assistance during the Christmas season.

On February 13 and 14 a convention was held at the Virginia Mason Hospital Nurses Home, Seattle. The program included speakers on diet therapy, administration, and the world food situation. Margaret Hanney, Director, Washington State Dairy Council, presented "Nutrition and Business." Dr. J. Richard Huber, Professor of Economics and Business, University of Washington, spoke on "The Marshall Plan and Food." Following a dinner held at the Sorrento Hotel, Mildred Bonnell, Assistant Director of Food Service, University of Washington, talked on her experience in China.

Other speakers and their topics were: Dr. Caleb Stone, Surgeon, Virginia Mason Hospital, "Protein Need in Post Operative Diet."; Dr. H. Charles Franklin, Obstetrician, U. S. Public Health Service, "Diet in Pregnancy"; Joseph Crampton, Virginia Mason Hospital, "Diabetes and Diagnosis"; and S. H. Steen, Marketing Specialist. Department of Agriculture, "The Meat Outlook for the Coming Year." The convention concluded with a luncheon at the Washington Athletic Club. Dr. Lee Powers, Director of Student Health Services, University of Washington, was the guest speaker.

## *News of Advertisers and Exhibitors*

The *American Gas Association* has issued a new booklet, *Modern Kitchens for Homemaking Instruction.* In it are discussed the arrangement and equipment convenient for the teaching of homemaking, with special application to work in foods and related subjects. Gas equipment is featured. The eight chapters deal with selection of equipment, suggested instructions for students in the use of gas equipment, floor plans, color notes and decorations for kitchens, and trends in homemaking instruction. Copies may be obtained from the American Gas Association or the A.D.A. Library copy may be borrowed by members. . . . Early in February, the Consumer Service Department of *General Foods Corporation* officially opened a new institution test kitchen for the exclusive testing and development of the company's expanding line of institutional products. This kitchen was formerly situated in Hoboken, New Jersey. To celebrate the occasion, a press luncheon was held at the Barberry Room on February 2. Doris Johnson, Teaching Dietitian, Presbyterian Hospital, New York City, acted as the JOURNAL's representative at this function. The new kitchen is located at 234 East 45th Street, a few blocks from the Company's general offices in New York City. Plans for the kitchen and selection of the equipment were under the direction of Bertha Nettleton, Director of Institution Service. Kathryne Pennington will be in charge of the work at the new kitchen, under the supervision of Eulalia Blair, who is in charge of all General Foods test kitchens. Aiding in the quantity recipe service and recipe development will be Mildred Hearn, who recently joined the staff of the Consumer Service Department as Miss Nettleton's assistant. A cordial invitation has been issued by General Foods to all dietitians to visit the new kitchen when in New York . . . . A new product, Jell-O Tapioca Pudding, has been added to the Jell-O and Jell-O Pudding family, and is now being sold through grocery stores in the Midwest and West. This new *General Foods* product is manufactured in both chocolate and vanilla flavors. . . . *Seco Company, Inc.*, has announced that fountain units, related equipment, and accessories originally designed excusively for Rexall Drug Company are now available to other fountain and food operators. These units will be marketed under the trade name of "Seco-Superex," through dealers who will have complete facilities for installation and service . . . A new line of lower-priced Garland fryers has been introduced by *Detroit-Michigan Stove Company.* The new fryers are said to be capable of producing fried foods faster and with improved quality. Their outstanding feature is the use of stainless steel baffles inside each of four oval-shaped tubes. The design permits application of a greater amount of heat to the tubes in the fryer bowl, but because the baffles spread heat more evenly over the tube area, the fat is not subjected to extreme "spot" heat. Thus fat is conserved and costs reduced. New lower, cold zone temperature also contributes to better food quality by further preventing charred food particles from rising and clinging to food.

### *Stouffer Promotes Afternoon Teas*

In Minneapolis, Cleveland, and New York, the Stouffer Restaurant Corporation has introduced a new tea service which seems to meet with warm approval from its customers. In Minneapolis, where a "bit of Sweden" is always welcome, it is called "Svenskt Kafferer" and is a coffee hour. In Cleveland and New York it goes by the name "Continental Tea."

For the tea hour, the dining room takes on an air of leisurely dining with a large table set up with all the home touches of a pretty table cloth, flowers, candles, and a samovar. On the table are tray arrangements of tea cakes, Swedish cookies, small tea rolls, and sweet buns. The waitress serves the tea or coffee in pots and then passes the trays "in the continental manner" for the customer to choose her sweet. A nominal charge is made for the service, regardless of selections.